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Contents

EDITORIALS 3

America—A New Vision for the Campaign—Channels of Trade Should be Unobstructed—The Passing of the Section Meeting—The Salesman Auxiliary—Electric Trucks and the Good Roads Program—Electrification of Railways—Prospecting for Future Employes—Why Prices are not Going Down—New Journal Service.

ELECTRICITY AT SUMMER CONFERENCE GROUNDS 6

An illustrated account of the well-known conference grounds at Asilomar, and of the part which electricity plays in their equipment.

ELECTRICITY IN THE MAKING OF MOVING PICTURES — by Carl M. Heintz 9

How and where electricity is used in the stage-cities of the moving picture companies and in the creation of a movie film.

CHOOSING AND TRAINING THE MAN FOR THE HIGH POSITION—by Julian McGill 11

Some ideas on the subject of what the company can make of the employe, and of the methods and value of cultivating good material within an organization.

HIGH-POWER FACTOR INDUCTION HEATERS — by C. Edward Magnusson 17

A new design in induction heaters which improves the power factor and opens up a wider field for their use.

NOTES ON SUSPENSION INSULATOR DESIGN — by H. L. Garbutt 19

A new series of laboratory tests with a modified type of insulator design which gives promise of more satisfactory service under line conditions.

CONSTRUCTION DETAILS ON THE MARIN WATER AND POWER PROJECT — by H. M. Bowers 22

Tunnel and pipe line construction details and costs on the Marin project recently dedicated, as quoted by the engineer in charge of office detail.

WATER SUPPLY AND THE PUBLIC LANDS — by W. B. Heroy 24

Conditions determining the classification of lands and the basis for fixing water rights and right of way privileges.

THE INTERNAL COMBUSTION ENGINE ON THE PACIFIC COAST — by George Dow 27

Some of the history and development of the Diesel Engine, and details and pictures of the recent installation on the "Libby Maine."

Electricity Played Its Part—Frontispiece 2
Electrical Fish Screen Used to Keep Fish Out of Irrigation Canals 8
An Enterprising Retail Store 8
Sending Mazda Lamps by Mail 12
The Electric Fan and the Summer Sale 13
Electric Arc Furnace in Use 14
Safety First Instruction Through Moving Pictures — by Ernest A. Dench 15
A Summer Use for Your Roof — by Ross B. Mateer 16
Western Ideas 23
Trade Catalogs, Photographs and Lantern Slides—Their Filing and Indexing — by Louise B. Krause 25
Practical Lessons in Electricity: Armature and Field Windings — by H. H. Bliss 30
Ringing Device for Transmission Line Telephone — by E. L. Blaine 32
Sparks 33
Personals 34
Meeting Notices for Electrical Men 36
Where the Men of the Industry Meet 38
Happenings in the Industry 40
Influence of Forests on Water Supply — by J. C. Stevens 42
The Latest in Everything Electrical 43
Books and Bulletins 45
New Electrical Developments 46
The Vacuum Cleaner 48

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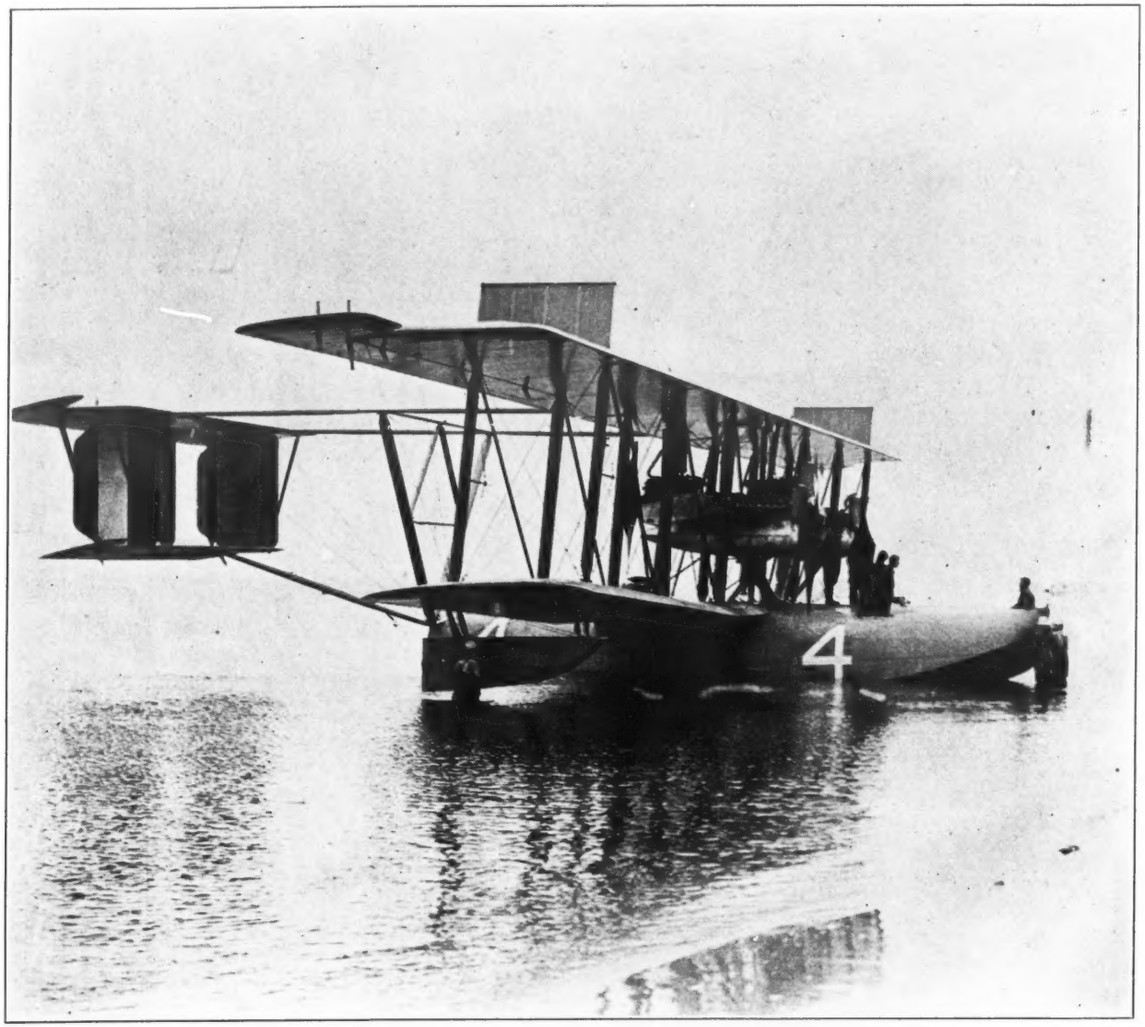
Index to Advertisers—page 20 Where to Buy in the West—pages 21-26



Electricity Played its Part

in the crossing of the Atlantic by airplane.—Indeed, without the inter-communicating telephone system made possible by the invention of the anti-noise telephone transmitter, the flight of the NC-4 could not have been attempted. The roar caused by the propeller and the Liberty engines is so great that no human voice can be heard above it —and it would have been impossible for aviator and pilot to have held necessary communication with each other but for the invention of two San Francisco men, E. S. Pridham and P. L. Jensen of the Magnavox Company. By opening up the transmitter so that the noise of the engine reached both sides equally, while the voice impinged directly against one side and hence alone was transmitted, communication during flight was rendered a simple matter and, incidentally, the field of usefulness of the airplane greatly widened.

JOURNAL OF ELECTRICITY

DEVOTED TO THE UPBUILDING OF THE ELECTRICAL INDUSTRY IN THE WEST AND IN THE COUNTRIES BORDERING THE GREAT PACIFIC

Volume 43 SAN FRANCISCO, JULY 1, 1919 Number 1

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FRANKLIN K. LANE says: I would give to the man whom I wished to Americanize (after he had learned the language of this land) a knowledge of the physical America, so as to get an admiration, not only of its strength, of its resources, of what it could do against the world, but that he might have pride in this as a land of hope and land in which men have won out. I would take him across the continent. I would show him the 8,000,000 farms which went to feed Europe in her hour of need. I would take him out into Utah and show him that mountain of copper they are tearing down at the rate of 38,000 tons per day. I would take him to the highest dam in the world, in Idaho. And I would let him see the water come tumbling down and being transformed into power, and that power being used to pump water again that spread over the fields and made great gardens out of what 10 years ago was the dryest of deserts. . . . I would show him the struggle that we are making to improve the bad conditions. I would tell him not that America is perfect, that America is a finished country, but I would say to him, "America is an unfinished land. Its possibilities shall never end and your chance here and the chances of your children, shall always be in ratio to your zeal and ambition."

No one can say when we shall have reclaimed all our lands or found all our minerals or made all our people as happy as they might be. But out of our beneficent, political institutions, out of the warmth of our hearts, out of our yearning for higher intellectual accomplishment, there shall be ample space and means for the fulfillment of dreams, for further growth, for constant improvement. That is our ambition.

America, we dare believe, will ever remain unfinished.

A New Vision for the Campaign

Now that the Pacific Coast Section N. E. L. A. has gone on record, through its Public Policy Committee, of favoring the establishment of a Service Bureau to handle matters of publicity and information regarding various questions of utility life in the West, the question naturally arises as to whether these important matters under the guiding vision of the Public Policy Committee can not best be handled through the Advisory Committee of the California Electrical Co-operative Campaign.

It would seem that, with the excellent personnel of this committee, here is a way of least additional outlay of money to handle in a most effective manner these new responsibilities.

The word cooperation not only signifies cooperation in matters of merchandising but indeed in every phase of human endeavor in connection with matters electrical in the West.

It is believed that here is a possibility for a new and even greater vision of mutual helpfulness never before thought possible of realization in the California Electrical Cooperative Campaign. The idea is a big one but the progressive West has ever proved herself equal to the occasion. The excellent results being attained by the Advisory Committee warrant the earnest consideration of the suggestion of turning over to its personnel the carrying out of the work evolved for public enlightenment by the Public Policy Committee.

The Passing of the Section Meeting

Hitherto the Pacific Coast Section, N. E. L. A., has largely held its annual convention in separate rooms—one for the Engineering section and the other for the Commercial section. It is now generally recognized that the simultaneous holding of these sessions is quite undesirable as it prevents a certain breadth of discussion from being attained. The engineering phases of a commercial discussion as well as the commercial phases of an engineering discussion are both exceedingly desirable and without them the greatest good of timely discussion of this nature must fail of accomplishment.

It is greatly to be desired as a consequence that these sections continue their helpful investigations as in former years, but that the sessions be not made to conflict in their setting.

In order that the best results be accomplished, care should be taken prior to the annual sessions to see to it that these opposite phases of viewpoint be properly called to the attention of those in the engineering or commercial sections best able to give this breadth of view, in order that some thought and study might be given to the subject before the final meeting.

Channels of Trade Should be Unobstructed

More and more men of the electrical industry are realizing that the channels of trade should remain unobstructed. As to whether the electrical manufacturer, the jobber, the contractor-dealer, or the central station undertake the actual merchandising of electrical ware it is of little consequence, for after all economic laws will at length adjust this matter to their full satisfaction.

Proper cost accounting will demonstrate these economic channels through which trade the better and more economically flows.

The first thing to do in all matters of a perplexing nature is to gather together all parties to the issue, and having gotten together, establish a code of ethics upon which transactions must be based. With firm adherence to principle when once established, little difficulty is to be anticipated. Such are the ideals of the great electrical cooperative movement that found its inception in the West and is today sweeping the nation with the force of their vitality.

The Salesman Auxiliary

The most recent idea of helpfulness to originate with the California Electrical Cooperative Campaign is the salesman auxiliary. Summed up, the new idea is designed to effect a method whereby the jobbers may be apprised as to what is going on.

It is now pretty well recognized that in spite of the written word, with its manifold ways of propagating information, the "word-of-mouth" method, old as the human race itself, is the safest and surest way to carry conviction to the person desired to reach.

The actual operation of the new scheme involves the appointing of committees in various centers of distribution among electrical salesmen who will advise themselves fully concerning the campaign and then as occasion arises pass the word to the trade in as emphatic and timely a manner as possible.

The new idea has a two-fold purpose; first, to pass to a group of wide-awake men the live features of the campaign, which in itself can not fail to bear fruit, and secondly, the making possible of a new channel of expression for the campaign in its effort to reach the trade as a whole. The idea is sound and it is believed splendid results are bound to accrue.

Electric Trucks and the Good Roads Program

The question of good roads is very much to the fore in both state and national legislation. It is looked upon as a military and economic asset, and as a means as well of providing employment for returned soldiers.

In many respects it is a matter of great interest to the electrical industry. Good roads mean the development of new regions of the country, the encouragement of settlements in districts not yet opened and a consequent demand for electric service and electric equipment.

A further interesting development in the recent use of motor trucks for short haul deliveries in rural districts opens possibilities for the electric truck. The good roads in the vicinity of large cities have made it possible in many instances to adopt electric vehicles for parcel post deliveries in adjacent rural districts. This was probably the forerunner of the present movement. Not only is the truck being used for hauls to and from the railway, but for short distances as a substitute for the railway. One canning establishment goes so far as to pay 10 cents extra per box for motor delivery of fruit, finding that direct delivery eliminates losses through spoiling due to delay and to frequent rehandling necessary in rail transportation.

Electrification of Railways

Many arguments are being advanced favoring the electrification of railways as a means toward conserving fuel and keeping in line with the march of progress. Two thousand acres of wheat recently destroyed by fire in Utah directly caused by the present method of steam operation, is another silent yet forceful argument that adds to the daily growing list of reasons why the method electrical will, from its added momentum as the days pass by, soon prove to all opposers irresistible in its onslaught.

Prospecting for Future Employes

It has been the practice of most large power companies to find employment for several college students each year during the summer vacation period. There is usually summer construction work to be done and the boys as a rule come recommended from professors or other engineers known to the men in charge.

This is all more or less casual in present practice, but holds the possibility of real service if carried out on a more consistent basis. Every public utility is on the lookout for promising material—it is usually worth actual money to them to know the two or three best possibilities in a class of graduating engineers. The best way to secure this information is at first hand. By making a definite policy of employing well recommended college boys with a view to later taking them into their organization on a permanent basis, the company not only attracts men of an ambitious calibre, and has an opportunity to see what the available material is worth, but has a chance as well to interest just the men it chooses in its organization and in some measure to influence their preparation along the lines most suited to their future employment. The college is, of course, not the only source of available material, but it is one of the most fruitful, and the usual criticism of college boys that it takes some months for them to become adjusted to conditions of actual work, could largely be eliminated by letting them pass through this period during the time of training in the college vacations. It is the best proof of the health and vigor of any organization that it attracts to it the best brains and enterprise of each generation as it comes along.

Why Read Your Technical Magazine

A recent conversation brought to light the fact that there are to be found business men who subscribe to a commendable number of technical magazines covering their trade, who yet fail to remove the wrappings of these magazines when they arrive. The justification offered is that the successful business man, be he engineer or merchant, by the very nature of his success has no time for reading.

And yet you will find that the most successful business man is the one who does keep in touch with the advances of his trade or profession, who knows what new methods have been recently worked out, what problems are interesting his fellows, what experiments are being tried. The doctor must keep in touch with progress in his profession or he is very soon branded an "old fogy"—no less must the engineer follow the advances in construction and theory, the merchant the up-to-date practices of other parts of the country, the plans for nation-wide campaigns and up-to-the-minute practice in merchandising. The technical magazine is the best source of this information. Books on other than fundamental subjects are in some measure out of date before they are published—to depend on personal contact and gossip for keeping in touch with your world is to revert to the middle ages or the interior of illiterate Russia in the scale of progress.

The subscription to a magazine is an expenditure for which a return is expected. The technical magazine expends its fullest energies to make that return. It has established avenues of connection not open to individuals through which it keeps in touch with advances as they occur, it studies the problems which become apparent through this close contact—it endeavors to meet them and to offer just that news, those statistics, this solution which its readers most need. Not to take advantage of this service is to disconnect your telephone after paying your bill; is to hire a clerk and then keep him with hands folded while you work overtime.

Why Prices are not Going Down

A most lucid analysis of present price conditions has been made by the Division of Public Works of the Department of Labor, preparatory to the encouragement of general construction activity. As they point out, most people believed that the high level of prices reached during the war was caused merely by the extraordinary demand for commodities which exceeded the supply. It was also commonly believed that the industrial capacity of the world had been greatly expanded under the stimulation of war orders, and that this expansion would bring sharp competition between rival concerns in time of peace. Furthermore, it was thought that there would be after the war great armies of unemployed workmen, who would be compelled by necessity to accept work at low wages; that there would be sharp competition among the leading nations in international trade; and that buyers generally, looking forward toward an era of lower prices, would postpone buying. In the light of these considerations it was but natural for people to expect a great fall in prices, and even to fear an industrial panic.

However, the expected great fall in prices has not occurred, and it is not likely to occur for the following reasons:

1. The rise in prices during the war was not merely the result of a great demand for goods and of a scarcity of certain goods. It was largely brought about by means of inflation of the currency by the governments at war and by the neutrals, either by the direct issue of paper money or by the issue of bonds. Although war orders are now largely a thing of the past, the extension of credits still exists as a continuing cause of high prices. There is little to indicate an early contraction of credits.

2. World production in general during the war, contrary to a widely held view, was not abnormally large, but the abnormal consumption of certain goods for war purposes has depleted the stocks of commodities of the world.

3. Armies of unemployed, in the United States at least, have not materialized, and an actual labor shortage is in prospect.

4. Buyers since the armistice, although showing a desire to wait for lower prices, have been compelled to buy to meet their daily needs. During the war, because of scarcity of commodities and high prices or because of patriotic self-denial, they did not buy in advance of need, as is customary in an era of rising prices. Consumers' goods are in great demand and retail trade is now moving in great volume.

5. If the production capacity of industry should be greatly increased, lower prices would not necessarily follow. If there is a strong enough demand for commodities, prices need not fall, no matter in how large volume commodities are produced. There is every reason for expecting such a strong demand. The world is now suffering from a great shortage of durable goods—buildings, transportation facilities, and industrial equipment. Furthermore people, both in the United States and Europe, have a stronger desire for consumers' goods than ever before. This is true partly because of the scarcity of certain goods during the war period, and partly because of the new experiences through which tens of millions have passed, which have awakened in them desires for goods and services they never enjoyed before. Along with greater production of goods there is likely to go further extension of credits rather than contraction. Neither the credit system of the United States nor that of the world has reached the limits of its power of expansion.

Business men of the United States, therefore, need not hesitate to plan for an immediate period of business prosperity. No period of depression and no collapse of values need to be feared. The man who goes full speed ahead will gain an advantage over his procrastinating competitor which will far outweigh any possible slight decline in costs of production.

NEW JOURNAL SERVICE: An authoritative discussion on the "Adaptation of the National Electrical Safety Code to Western Conditions" by Geo. E. Quinan is to be the feature of the July 15th "Engineers' Number" of the Journal of Electricity. The work and plans of Western engineering societies, a discussion of the status of railway electrification in the West, the future of the merchant marine and other problems of present day interest will be presented. A comprehensive report will be made on merchandising problems as discussed at the Santa Cruz convention of the California Association of Electrical Contractor-Dealers.

The index for Vol. 42, January to June, 1919, is now ready and will be mailed to any subscriber for binding upon request.

Attention is called to the fact that the "Latest in Everything Electrical" department of the Journal of Electricity is open to any new appliances or apparatus placed on the market. All contributions must be written purely from the standpoint of news matter, without advertising intent—and are subject to editorial revision and selection.

Electricity at Summer Conference Grounds

(The field for electrical appliances in the West is not confined to city hotels, but extends as well to summer camps and outdoor resorts. The electrical equipment at the Y. W. C. A. conference grounds at Asilomar here described is unique in many respects and suggests possibilities of a wider use of electricity along similar lines elsewhere.—The Editor.)

Extensive installations of electrical conveniences are usually associated with cities and with hotels and homes of luxurious appointment. In the West, however, where the greater distances of the country, combined with a willingness on the part of the inhabitants to depart from railway connections, even to some distance, make fuel transportation a difficult problem, electricity is found in extensive use in camps and summer outing spots. Wood is scarce and unsatisfactory for use on a large scale, coal is difficult to transport and very high, gas is out of the question in remote spots—and the only remaining fuels are oil and electricity. Both are used, but the great convenience of electricity for illumination, cooking and general power purposes, as well as the general acceptance of its use in this region of hydro-electric development, have led to its wide application.

THE ADMINISTRATION BUILDING

Electricity is used wherever possible, as other fuels are scarce. The Y. W. C. A. was fortunate in securing Miss Julia Morgan as architect.

A Pacific Conference Ground

One of the most interesting of these camp-hotel installations is that of the Asilomar conference grounds, conducted by the Y. W. C. A. near Monterey, California. This unique institution is the only privately owned center for conferences on the Pacific Coast—and the first of its kind anywhere under the management of the Y. W. C. A. It was started as a meeting place for college girls and the association conferences, but has been extended to serve as a general conference grounds, open to any association, either men or women. As many as eleven conferences were held there during one year. The Y. W. C. A. retains the management of buildings and dining service and merely rents hotel and camp accommodations together with use of the grounds to any applying group.

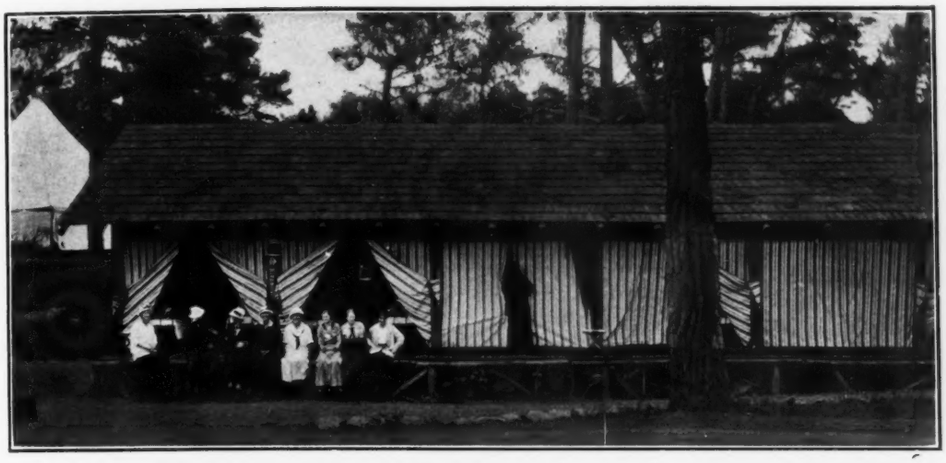
Extensive Use of Electricity

The accommodations consist of an administration building and large meeting hall, a chapel, a lodge with steam heat and hotel comforts, a second building not steam heated and eleven tent houses, providing for 32 guests each, besides the dining room, kitchen, rooms and laundry for the girls who do the work, garage, hospital and such auxiliary buildings. These are all lighted by electricity, furnished from the Del Monte power plant located on the hotel grounds at Del Monte, Cal.

THE DINING HALL

All food is cooked by an electrically operated fuel oil range, all dishes washed by electric dish washers. An electric dough mixer, mayonnaise mixer and a toaster complete the equipment, but more is contemplated.

Forty thousand dollars were to have been spent on permanent improvements within fifteen years, according to the original agreement with the Pacific Improvement Company. Within the first five, over two hundred thousand have already been invested. Part of this was put into the electric pump and other equipment described in this article. The plan of the grounds is that of scattered buildings. Paths between are electrically lighted.



The camp provides accommodations for over 500, mainly in tent houses as here shown. These are electrically lighted, and water for other purposes than drinking and washing is electrically pumped on the premises. The outfitting of these grounds was made possible largely through the generosity of the late Mrs. Phoebe Hearst, who took a great interest in the Y. W. C. A. during her lifetime.

The Administration Buildings

The administration building is the headquarters of the establishment and contains a meeting room capable of accommodating from five to six hundred, a news stand and candy shop, and lounging room facilities. The building is most attractive, of the rustic bungalow type, and is electric lighted throughout. Originally the fixtures were improvised from abalone shells appropriate to the Monterey region, but it was found that these did not give sufficient light—and simple indirect fixtures were substituted. The candy shop specializes in home made candies, which are made, most of them, on a small electric grill in a back room.

The simple chapel, with its wonderful outlook on the ocean, is one of the features of Asilomar. It is finished in soft redwood with dull blue hangings and the whole end of the building behind the pulpit stand is in the form of an enormous window overlooking the rocky coast. The audience has always this view before them, and with all the comforts of an interior auditorium, quite gains the effect of being out of doors. The lighting of this building is also of the simple semi-indirect type, but holds a particular beauty in the reflections of the light from the pine trees out of doors at night.

Lodge and Tent Accommodations

For the convenience of guests and older persons who would not be comfortable in tent quarters, hotel conveniences are provided. These have steam heated rooms, heated by an oil furnace electrically operated, and other comforts of the usual hotel. More simple accommodations, but still indoors, are open to those who do not care for tents. The main sleeping quarters are the tent houses, however, each providing rooms for thirty-two. These are in the form of double rows of tent rooms with a corridor and verandas on either side, on which the beds are usually arrayed at night. These also are electrically lighted, a feature not only of great convenience, but of safety as well. A small hospital is provided in case of emergency, pleasantly located and well fitted out. The lighting and a small sterilizer for surgical instruments, electrically operated, make up the electrical equipment here.

The Stuck-Ups

Service is furnished by college girls in the employ of the Y. W. C. A. To care for this "help" a special institution of "Stuck-ups" has been inaugurated. The privilege of this employment is highly prized, so much so that it has been found necessary

The location as well as the picturesque buildings go to make Asilomar unique. And this "Retreat-by-the-Sea" is not picturesque at the expense of comfort—but is provided with a most complete electrical equipment for the convenience of guests and employes.

to limit it to one year. Girls are drawn from as many colleges as possible, particularly from among those who are earning their own way—and no girl is permitted to serve more than one season. They call themselves the "Stuck-ups" and have a little chorus which is given on occasion, to the effect that, being stuck-up, they stick together. Their quarters are called Stuck-up Inn, and are provided with the same facilities as elsewhere. In addition the girls have a laundry for their own use where they are permitted the use of electric irons. These make possible the starchy cleanliness of their appearance in the dining room.

Electricity in the Kitchen

The main use of electricity, of course, is in the dining room and kitchen department. Oil is used for fuel in the burners of the range and bake oven, which are electrically operated. This is true also of the steam table and coffee urn which use steam from the central heating plant, utilizing oil for fuel with electric motive power. There is further a large dough mixer, a mayonnaise mixer for eggs and sauces, an electric dish washer which gives great satisfaction in use, and an electrically operated potato peeler. Electric toasters are used with excellent results. An idea of the capacity of the kitchen facilities is to be gained from the fact that 580 guests have been entertained at dinner at one time.

Saw Mill and Pumps

One of the features of the evening at Asilomar is the great bonfire, which is much enjoyed for its own beauty and for the jolly program which is always arranged. This is made possible through the use of an electric saw which readily handles the wood and subdivides it into logs of a convenient size for handling. With so many women employes it becomes necessary to have most of the heavy work handled by machinery—a method which has proved both satisfactory and, in comparison with other possibilities, economical.

There is a well on the place which supplies water suitable for other uses than drinking. A turbine pump attached to this source of supply keeps two tanks filled and provides water for all irrigating, flushing and like services. Drinking water is piped in from the general peninsula water supply.

Additions Planned

The installation is one of the most extensive on this coast—and is not yet complete. With the growing scarcity of wood and the high prices of fuel oil, the camp management is looking to electricity to play a still greater part in the camp and plans for extensions are already under way.

ELECTRIC FISH SCREEN USED TO KEEP FISH OUT OF IRRIGATION CANALS

An electric fish screen, designed to prevent the immense loss of fish through irrigation canals, said to run as high as 40 per cent annually of the fish supply in certain streams, has been in operation at the Utah State Fish Hatchery at Murray for some time, with good success.

The screen is the invention of H. T. Burkey of Tulsa, Oklahoma, and is so arranged that currents of varying voltage and amperage are passed through the water at the head of the irrigation canals. The strength of the current is graduated, so that the smaller fish, coming down the canal from the river, will meet with a current that is designed to send him skeltering back to safety and the river. A larger fish might not be affected by a current of that strength, but proceeding down farther will meet a current that will cause him to reverse propellers instantly. If the smaller fish were to encounter the stronger current he might be stunned, and float on down the canal and past the screen.

It is claimed that approximately 95% of the fish will be prevented from entering the irrigation canals by the use of this device.

AN ENTERPRISING RETAIL STORE is that of the Levy Electric Company of San Francisco. Mr. Levy makes a specialty of residence district trade and his motto is Service. Note the bin arrangement in the counter display and the compact storage of stock. Lamps form the backbone of the dealer's trade and advantage is taken of this by frankly tying-in with national advertising, both in the Mazda girl at the left who stands directly before the open door, and in the carton display over the shelves.

The Thomas Ince Studio at night, showing one use of electricity in motion picture making

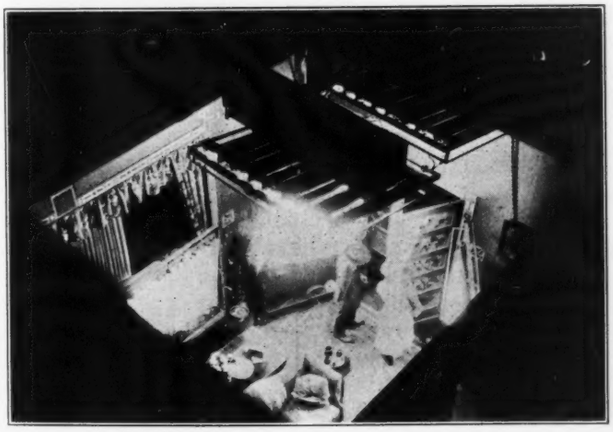
Electricity in the Making of Moving Pictures

BY CARL M. HEINTZ

(The moving picture on the screen is familiar to all of us but the moving picture in the making is something different. The methods of conducting a moving picture studio, the elaborate equipment which goes to the production of a modern film, and the part which electricity plays in the scheme, are interestingly illustrated by this account of some of the well-known studios of Southern California. The author is connected with the Promotion Division of the Westinghouse Electric & Manufacturing Company, Los Angeles.—The Editor.)

A tourist was driving through Southern California, observing the different points of interest, when he passed a beautiful colonial structure surrounded by a magnificent lawn with big trees. He stopped the guide and asked, "What Country Club is this?"

This is only characteristic of the motion picture studios of today. There has practically been no limit to the expenditures put forth to beautify the studios and make them an asset both artistically and commercially to the community.



As a setting looks from above. Banks of mercury vapor lamps give the proper spread of light and then highlights are secured by the use of arc lamps.

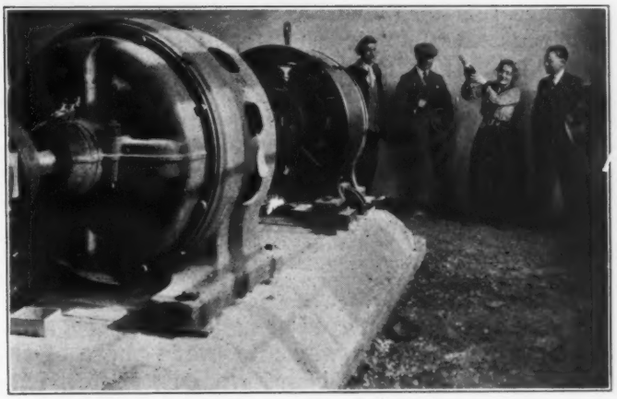
Growth of the Motion Picture Industry —

The motion picture industry has grown from its infancy, six years ago, to the place of the third largest industry of the United States and is fast becoming the largest and most important industry of California. As nearly as can be estimated the total cost of production for the local motion picture industry for the past year amounted to some $160,000,000. The noted stars in these productions received a total of approximately $18,000,000 during the past year. This does not include the great number of "extras" employed for practically every picture.

A Modern Studio —

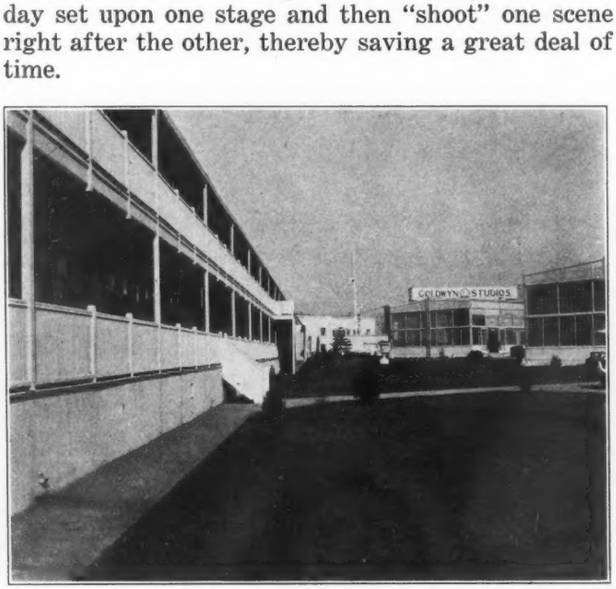
In and around Los Angeles are situated forty-six motion picture studios. Of course this includes large and small, some covering only an acre, while others cover several hundred acres.

The new Goldwyn Studios, which are among the most up to date of the studios in Southern California, were erected at a cost of over $1,000,000. The studio covers thirty acres adjoining the main building. Five complete glassed-in stages are inside the studio, and each of these stages is large enough to accommodate five companies at one time. However,



Bessie Barriscale of the Brunton Studios christening their new Westinghouse motor generator set. Later Miss Barriscale's name was painted on the base. From left to right: Walter Strohm, chief electrician, Robert Brunton, studio manager, Miss Barriscale and Mike O'Leeve, author.

it is very seldom that more than one company works on the stage at one time. It is customary for the director, before starting to "shoot" a picture, to have as many different settings as he will require for the day set upon one stage and then "shoot" one scene right after the other, thereby saving a great deal of time.



The Goldwyn Studio, which covers thirty acres. There are five glassed-in stages as well as some ten more out of doors.

Besides these five glassed-in stages the Goldwyn Studios have an out-of-doors stage which will hold ten separate companies or ten settings at one time. This stage is used for mob scenes, race track pictures, and so forth.

Every comfort is supplied to the employes, who number 450 without counting the film stars. This number includes the office force, carpenters (of which there are a great number), stage hands, electricians, etc. There are two hundred dressing rooms, equipped with all the latest conveniences, at the disposal of the actors. A complete library, barber shop, soda fountain, restaurant, laundry, infirmary, telegraph office, tailor shop and dressmaking establishment are maintained for the benefit of all employes, actors and actresses by the Goldwyn Studios.

A Complete City —

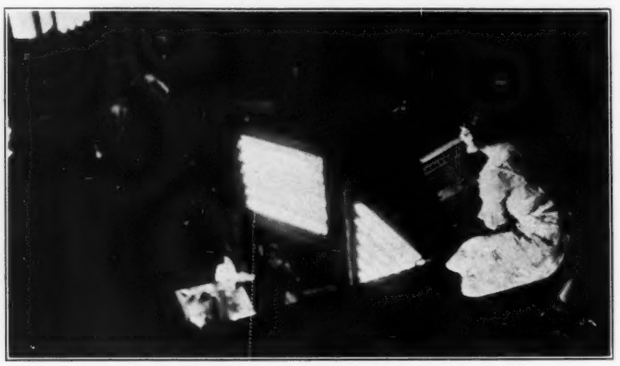
Universal City is another show studio of the West. Its studio of 360 acres provides wonderful settings for the famous Western Pictures which it produces. A complete zoo is maintained by this studio containing animals of every description from the four corners of the earth. From fifteen to twenty separate producing companies are steadily at work in the studio, and last year 500 complete motion pictures were turned out. Universal City maintains its own fire department, garage, pumping plant, restaurant and general store, and is a complete city in itself.

Electricity in the Movies —

Electricity has played no little part in this great industry, working its way into every phase of the motion picture work. The principal use of electricity is for the stage lighting.

In general, stage lighting is a combination of what is called "hard" and "soft" light. The Cooper Hewitt mercury vapor lamp, which is very largely used, possesses the actinic qualities that make it excellent for this work. The Cooper Hewitt is a soft light, and in order to bring out the high lights in a picture or to emphasize contrasts, arc lights are employed. These arc lamps, which throw off a "hard" light, are very generously used and consume a considerable amount of current.

It is generally known that an arc lamp operates better on d.c. than a.c. When operating on a.c. it changes its intensity of illumination slightly with every alternation, and since it is possible for this to synchronize with the shutter operating on the camera one can readily see why d.c. is more satisfactory for stage lighting.



May Allison, noted film star of the Metro Studio, turning the spotlight on a setting. For the general illumination the "soft light" of Cooper-Hewitt lamps is used.

The Electrical Equipment of a Studio —

It might be interesting to briefly outline the electrical equipment at some of the studios. At the Metro Studio, for instance, the Southern California Edison Company's incoming high voltage line of 15,000 is stepped down in a bank of 3—250 kva. transformers to 2200 volts. They also have another bank of 3—100 kva. transformers stepping down from 2200 volts to 110 volts, 3 phase. These supply the stage lighting circuits, the a.c. lights being mostly used for overhead lighting.

Mr. Walter Grams, chief electrician at this studio, is employing a very novel scheme to secure constant voltage regulation on his a.c. lighting circuits. It is most desirable to maintain a constant voltage regulation for two reasons—one that it produces better photography, the other that it increases the life of the Cooper Hewitt lamps. The Metro Studio has installed a 3 phase, 60 kva., 2200 volt induction regulator, which controls the bank of 3—100 kva. transformers on the lighting circuit. Then when the director calls for the lights and a very few seconds later calls for the camera to "shoot," the regulator has compensated for the additional load, which amounts to a great deal on large settings. The voltage under this arrangement never varies over a volt and a half at the point of distribution. The d.c. current for stage lighting is supplied by a 300 kw., 115-230 volt motor-generator set and 1—100 kw. motor-generator set.

Dave Barnett, chief electrician of the Clunes New Studio, has planned a novel installation. The

power house consists of a motor generator and transformer rooms. A 350 kva. transformer steps down the incoming line to 2200 volts and at present they have in operation a 75 kw. 3 unit motor-generator set and have on order a similar set with a capacity of 150 kw.

Thomas Ince's beautiful new studio is somewhat unique in its electrical equipment. Mr. Reeve Houck has installed a 250 kw. rotary converter. The fact that this rotary converter operates so well under the widely fluctuating load is due in large measure to the fact that the voltage circuit supplying this studio is controlled by an induction regulator.

Besides using electricity for stage lighting, the studios use a great deal in their carpenter shops, laboratories, projector rooms, etc. Practically all the electricity used by the studios is supplied by the Southern California Edison Company.

Choosing and Training the Man for the High Position

BY T. JULIAN McGILL

(With the industrial unrest of the present, it behooves the employer to give special attention to the choice and training of the men who are to lead his organization. Do you grow your own managers — or let some one else train them for you? The Chicago district manager of the Westinghouse Electric & Manufacturing Company believes in a proper training within the company. The following article formed part of what he had to say on the subject at the recent convention of Westinghouse Agent-Jobbers at Del Monte.—The Editor.)

The practice of corporations securing their brains through training by others, is incompatible with the principles of political economy, for a corporation that depends upon others for its men is guilty of commercial piracy, as its own gain is at the loss of others, who have a material financial investment in their men. It should be the duty of a corporation to expend sufficient sums to select and train men for their own needs, and allow adequate compensation to maintain their organizations up to the standards necessary.

Adequate Compensation —

This compensation should be sufficient for the average men to live in accordance with the standards compatible with the corporation's demands and to raise and educate their families to an equal standard. If this is not afforded, then the belittling self-consciousness of the man, that he is unable to rear and educate his family to his own level, works havoc with his contentment and too often with his loyalty. It is difficult to give a name to this psychological fact, but perhaps "Educational Unrest" defines it. It must be recognized, and the standard demanded by the corporations of its men should not be on a higher level than the opportunities afforded.

Furthermore, this obligation of just compensation should not be lessened due to the agreeableness of the employment with its incident increase in the available supply of applicants.

In considering the problem of just remuneration, corporations must recognize that present day efficiency methods demand that men must devote all their abilities and energies to their company's affairs, precluding the opportunity of other financial return than ultra-conservative investment of their savings.

New Ideas Grown as Well as Imported —

The statement that interchange of men alone brings new ideas into the company and thereby insures its progress does not justify the injury done to other companies supplying such men, and is disproven by those corporations earnestly endeavoring to train their own men. It is also doubtful that men in general have progressed due to this opportunity to take positions with others. Such positions are experimental and unless the opportunities are unusual, both men and business economics would make greater progress by having men continue to work with conditions under which they have been a proven success.

In most cases, men seek employment with others because they honestly feel their remuneration is less than their efforts and their results justify. This could be rectified by corporations recognizing the obligation through **salary, profit sharing** and **pensions** plans to compensate their men in accordance with their actual earning capacity, rather than giving a salary on the basis of replacement. Most men are loyal to their Company and to their stockholders and are willing to secure pay in accordance with their Company's financial status, but it is demoralizing when continually corporations largely through the continued and efficient efforts of their men reach a financial condition of affluence, only to use their excess earnings for the benefit of stockholders. This policy can only be construed as an effort to secure the plaudits of investors rather than to perpetuate the success and loyalty of their employes.

Essential Rules in Training Men —

There are no definite and exact rules governing the successful training of men, but the following are essential:

First— Correct organization under which men can work understandingly and have opportunity for continued development and advancement.

Second—Personal observation. Training to be effective must be fitted to the men individually, which must be accomplished by personal contact with the men.

Third— "Red Blood" in the Boss, which appeals to the worth-while elements in the character of the men. This is especially true with young men, and if the training has a well balanced sympathy and understanding of youth's viewpoint, a permanent development can be obtained.

Fourth—A financial remuneration justly based upon the man's earning power for the Company.

The Actual Loss in a Turnover —

A large amount of capital is invested in the men, which is dissipated upon men leaving the service. In an analysis made covering salesmen and sales

managers over a period of 15 years, of the men leaving, which varied from 10% to 25% per year, 90% left within five years of their initial employment. This record was as follows:

Within	the	first year	25%
"	"	second "	31%
"	"	third "	23%
"	"	fourth "	12%
"	"	fifth "	9%

This record showed to keep men for three years, reasonably insured a continuation with the Company. No doubt improper selection had much to do with the loss of men in the first and second years, which emphasizes the necessity of proper selection.

To these men who left, the corporation had paid in Salary and Traveling Expenses without any Overheads, the sum of $800,000.

Obviously no precise formula can be evolved for determining how much of this $800,000 was actually expended in training these men, which training was obligatory again with the new man, but for this highly trained class of employe it probably was $2500 or more per man, as the average salary and expense was $10,000 per man for the entire period of his employment, which with overhead added would probably be $20,000 per man. While the turnover and the numbers affected is less than with the wage earner, the training expense is very much higher and warrants the most serious consideration of all means for betterment.

Training to Blame for Failures —

Eliminating the men who have tendencies obviously unsuited for the particular business under consideration, it is well to reckon that the balance have sufficient qualifications, if the training can be made adequate for bringing out these qualifications. Few men acknowledge that men subordinate to them are failures due to the system under which they are required to work, and that others are successful in spite of such conditions. While the training cannot be made to develop efficiently every man alike, and often individual characteristics interfere with its efficiency, it is a just statement that when men are not being developed, who have had proper selection, it is due to weakness in the system, and not the men.

A number of business men are too penurious, and others too impatient to grow men. Their system fosters changing of men until they can get men who do passable work without requiring of the employer arduous supervision and training. Such methods necessarily produce mediocre men, and the company's standard must be lowered to meet the deficiencies of the men working under it.

The Principle of Advancement —

One of the greatest obstacles preventing successful training is for men, who are not developers, through the vagaries of chance, to reach positions with authority over others. This strangles growth and promotion from below, and is, therefore, a "blind alley" in the organization, which causes the loss of the best of the men subordinate to such men, and usually the overpaying for the job due to longevity in service. When promoting men over others, choose only men whose accomplishments insure their ability to grow and develop those subordinate to them. Recognize faithful service in men without this accomplishment by some other reward than giving them authority over other men.

Selecting the Proper Man —

As to the selection of young men or others without sufficient business experience to have demonstrated their qualifications, this must depend upon visible characteristics or qualifications as shown in school or college life, or in some unimportant business trial. Obviously this is somewhat problematical, as it is too involved for exact predetermination. In fact, there are no visible rudiments of character yet understood that are a precise pilot to the ultimate worth and adaptability of the individual. Present tests to ascertain mental and moral sufficiency or business aptitude prove only irrational contradictions. Therefore, the training must be adequate to develop the average individual up to the standard of effectiveness desired, as we must accept the necessity of choosing from that large class of men who have only normal abilities.

As to the selection of older men having experience and proven ability, too many are allowed to fail in the new position because of seeming inability to adapt themselves to their changed environments. It must be appreciated that these men are not so pliable as the young beginner, and therefore careful consideration must be given to the suitability of such men for the specific work to be done. "Teaching an old dog new tricks" is not insurmountable in business, but superior effort is demanded to shape men brought up under other training to your own organization.

Help Develop the Man Under You —

This subject of selecting and training men demands continuous consideration. All should give serious thought to the ways and means of helping the fellows below to develop. Do not suspect them or repress their initiative by ill-considered rebuffs, but help them to be one of the few who accomplish the things worth while. The upbuilding of men should be the greatest reward offered by a successful business career.

Finally, the Corporations must appreciate that few men can grow to be greater than their Company's estimate of their worth, and a belittling act by the Company should never be exercised without due consideration of the consequence to the man.

Also, Corporations should demand that their business be conducted with precise regard for the authorities invested by their organizations, so the effort of all will be well ordered and coordinated. This should be inviolable. Short circuiting the responsible man, either from above or below, is repugnant to the permanency of good organization, and without good organization, successful training and development of men cannot be accomplished.

It is essential that employes have an enthusiastic fealty for their organization. This spirit is probable only where the executives have a like loyalty and a studied effort to inculcate this feeling in their subordinates.

The Electric Fan and the Summer Sale

(With the midsummer months comes renewed interest in anything which can relieve the oppressiveness of extreme heat. The possibilities of the electric fan are legion, but hot weather is its golden opportunity. The Robbins and Myers Company of Springfield, Ohio, is responsible for the data in this article, which shows the right time, the right place and the right way to dispose of electric fans.—The Editor.)

The electric fan is an article which can be used the year around for many services other than the services for which it was originally developed, and the public is gradually learning more and more to use the fan at all seasons. As an aid to uniform heat distribution in winter it is almost as valuable as it is to prevent discomfort from the heat in summer. It can be used for drying clothes, photographic plates, vegetables, etc.; for driving steam and odors from the kitchen, refrigerator, closets, etc.; for keeping the frost from show windows, and dozens of other services which make it an article of year-around utility.

The Hot-Weather Opportunity —

From a sales angle, however, the fan is still a seasonable proposition, and can be sold to the best advantage during the one or two hot months of the year only. After the purchaser has obtained his fan he will use it for many of the extra services for which it is suitable, but in ninety-nine cases out of a hundred the appeal which makes the sale and the only one which will do so is the hot weather comfort appeal, and, curiously enough, this appeal is effective only right at the time when the prospect is actually experiencing the discomfort of hot weather.

The heat of one day is forgotten the next, provided a cool breeze has sprung up to dissipate the heat, and when one hot day or week has ended in a cool wave, apparently no one ever expects to experience another. So sensitive are fan sales to weather conditions, in fact, that, other things being equal, the sales of fans from day to day will fluctuate in exact ratio to the fluctuations of temperature. For this reason, it is obvious that the salesman who works while the sun shines is the one who will put his fan business over big.

Advertising the Fan —

When the warm weather is present, every possible means of placing the message of fan comfort before the public should be utilized to the limit. The sales helps furnished by the fan manufacturer should be employed so that every possible user of a fan will get the message in some form. Newspaper advertisements, movie slides, window displays, mailing folders, all available advertising helps should be put to work on the first real hot day.

These advertising helps should, of course, be supplemented by personal and telephone calls, where the prospects are best for sales. Lists of such prospects should be made up in advance of the fan weather, so they will be ready for use when the hot weather breaks.

In Homes —

Lists should be made up of homes where there are small babies and invalids. These can be compiled from news items in the press and from birth records. Such prospects could be covered by telephone calls. A tactful reference to the value of a fan as an aid to convalescence or as a comfort to the little one, with an inquiry as to whether the prospect would like to have one sent for trial, will bring many trial requests at small expense, and once the fan gets into such homes on trial, the results it shows will usually make the sale.

In the Office —

Small offices, such as the doctor's, dentist's, lawyer's, architect's and others, can also be solicited by telephone. A cheery reference to the heat and a request to permit a fan to be sent over to demonstrate how much better the work will go with its help, will usually prove productive of many orders.

Large offices where many people are employed should be given attention by personal calls. Here the advantages of fan comfort can be sold on a straight business basis. The manager or owner should be told how fans will pay their cost and over again every season in more and better work and better satisfied employes.

Stores, motion picture theatres, restaurants, soda fountains, hotels, etc., are all good prospects for quantity sales. Here, of course, the salesman should show the proprietors how fan comfort will attract people to their places of business during the hot weather. He should also show how it will make their clerks, waiters and other employes more alert and cheerful, with a result which will react upon the patrons they serve and result in more liberal patronage.

In Factories —

Factories, particularly those where girls are employed, are excellent prospects. During the hot weather, heat prostrations are common among girl factory workers, resulting in reduced production, expensive medical attention and dissatisfaction among the employes. When the employer realizes that the installation of electric fans will eliminate these difficulties, he will recognize the purchase of a fan equipment as a profitable investment.

Hospitals are excellent prospects, as the fan is a real aid to quick convalescence during hot weather. When the hospital board cannot be influenced by direct salesmanship, often they be sold through indirect methods. For example, a fan sold or loaned to one private patient in the hospital will make such a strong contrast between the room where the fan is used and others not so equipped, that doctors and nurses will be strongly impressed with the value of fans, and their remarks will help put the message across with the management and directors.

The Value of Demonstration —

Wherever the fan can be shown in operation, it is always in itself the best possible fan salesman.

A demonstration is better than the best verbal arguments of the best salesman. During hot weather the store should be equipped with fans in operation, so that no person can come into the store for any purpose without getting a demonstration of fan comfort. Price tags, counter signs and folders should be arranged about, so as to invite a direct inquiry from the caller before he leaves the store.

The passers-by on the street can be reached in a similar way by having a fan in operation just outside the window or door, so that it directs a breeze toward the sidewalk. A sign near the fan, such as, "If you enjoy this breeze, take it with you. Come inside for particulars," or something of this nature, should be used to clinch the sales message of the fan.

If sales policies will permit it, fans should be sent out on trial at every opportunity. However, in doing this it is very important that they be sent at the right time. On a cool day a fan sent out on trial is effort wasted. On a severely hot day, it nearly always means a sale, as mighty few people are willing to give the fan up when they are enjoying its use.

A Fan as an Investment —

The instalment plan of payment is a big help where it can be used, particularly when the power company is selling the fan and charges for it simply by adding a small amount to the bill for current each month. Paid for by this method, the purchase of a fan seems like a very small item to the average customer.

It is also well to emphasize the low current consumption of the fan by pointing out that it uses no more current than an ordinary Hydro lamp, and that it will not add a noticeable amount to the monthly current bill. Many people imagine, because a fan makes a great stir and commotion in the air, that it must use a lot of current. This impression should, of course, be corrected.

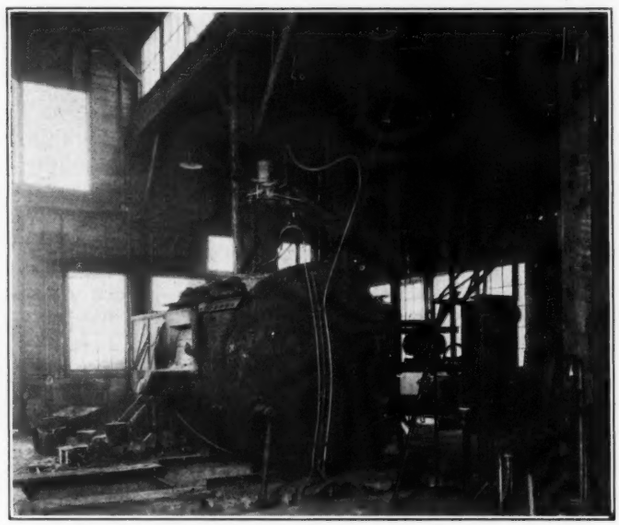
In every case, whoever the customer may be or whatever the sales plan may be, emphasis should be laid upon the fact that a good fan is not a purchase for one season only, but that the fan will last many years—often a lifetime, and figuring the cost of such a fan in terms of cost per year, it represents an investment of but two or three dollars per year, in return for which the owner receives many dollars value per year in comfort, better health, and better work.

ELECTRIC ARC FURNACE IN USE

(The possibilities of electric smelting in the West have been the subject of much recent discussion. Whether sufficient cheap power is available for ore reduction is still a matter of question, but the use of electricity in steel making seems to be firmly established, as indicated by installations similar to the one here described.—The Editor.)

The Aurora Foundry Company of Seattle, Washington, installed a 1½ ton single phase, Greene Arc Furnace for melting steel for castings, and this furnace is now in regular operation since early in December, 1918. It is capable of melting 1½ tons of steel scrap and finishing this metal ready to pour into castings in about two hours' time.

The electrical equipment consits of two 400 kva. single phase transformers, taking current at 15,000 volts and transforming to about 100 volts on the furnace. These transformers operate in parallel. The electrode is operated by hand, and the contacts in the electrode holder are water cooled.



A 1½ ton Greene Arc Furnace as installed at the Aurora Foundry, Seattle

This furnace is built of the standard Greene Rolling Cylinder type of construction. The shell is of heavy plate riveted to dished boiler heads, and a track is attached to the bottom of the shell providing for the rolling of the cylinder on the heavy rails of the foundation. Hydraulic cylinders attached at the end of the shell where they are out of danger from any molten metal serve to tilt the furnace. It may be tilted forward for pouring the metal or backward for the removal of slag.

The door is of special construction and may be very easily sealed to prevent air getting into the furnace. The lining is specially designed and is adapted to long life under the heat of the electric arc.

The Greene Slag Process is used for melting and finishing the steel. When steel scrap is melted in an electric furnace, the rust or iron oxide covering its surface is melted and absorbed in the molten mass. In addition, if the molten metal is exposed to the air a certain amount of oxygen is absorbed from the air. These absorbed oxides are the chief cause of "wildness."

The Greene Slag Process is a method of producing a fluid slag from very cheap and common material which floats over the molten steel in the furnace, preventing the air from coming in contact with the molten metal and being absorbed. At the same time the floating slag absorbs the oxides from the molten metal so that at the proper time these oxides are reduced in the slag by the addition of inexpensive reducing agents, returning the formerly oxidized steel to the molten metal below, as pure steel. The result is that the steel is "killed" perfectly within the furnace and at a material saving over other and more uncertain methods.

Safety First Instruction Through Moving Pictures

BY ERNEST A. DENCH

(The movie has now attained to a secure position as a medium of education; and as an aid to the safety-first campaign especially it has obvious advantages over other methods by virtue of its concrete dramatic possibilities. The fact that suitable films are available, at very slight expense, to any company desiring to use them, will doubtless lead to a more general adoption of this method of educating employes.—The Editor.)

Are your drivers careful? They may have the best intentions in the world, but unless they are taught to respect safety-first measures, their good intentions will amount to nothing. The writer lives in an outlying section of a large city, and during the present summer when the children have been playing in the streets, he has not failed to note the careless driving indulged in by the boyish chauffeurs entrusted with the delivery wagons. It has been little short of a miracle that no children have been killed, considering the amount of speeding and the swift turning of corners indulged in. This is the sort of thing which is going on all over the country to a greater or less degree, together with other violations of safety-first measures. And the company's first knowledge of a driver's carelessness will be when some one files a suit for injuries received. The loss of several thousand dollars is not all; the company must consider the amount of bad feeling which such a case causes among its customers.

Illustrating Your Safety-First Talks —

Even though you may be in the habit of giving your drivers a safety-first talk every week, you can make your talks much more effective if you illustrate by motion pictures the examples given. It has been stated that "eighty-seven per cent of human knowledge comes through the eye-gate," and where can you find another medium which visualizes facts, drives home concrete examples, and stimulates the imagination as the moving picture does? It is by appealing to the imagination that we are able to use the necessary foresight in guarding against accidents.

Films Available for the Purpose —

It is no longer necessary for a company to go to the great trouble and expense of having a suitable safety-first film made, for there are already several excellent reels available from sources that employ motion pictures exclusively for educational purposes. This means that the company can secure the loan of suitable safety-first films at less than what they cost to produce and distribute.

First, there is the reel entitled "The Making of a Convert," to be obtained from the National Safety Council, Continental and Commercial Bank Building, Chicago, Illinois, through members of the council. The rental charge is $1.25 per day. The story this picture tells is of a motorman who does not believe in the principles of safety-first. He refuses to obey any of the company's precautions, but in the end he is persuaded to attend several safety-first meetings and becomes an enthusiastic convert to the cause.

Another picture to be obtained from the National Safety Council is "The Rule of Reason." The story deals with the influence of drink and its effect on railroad work; but as the drink appeal is universal, the picture is quite suitable for any company's purpose. The writer has not been able to see the picture, but, according to the synopsis supplied, it deals with Bob Tracy, a young man employed as a yard brakeman, who, because of unsafe habits, is a thorn in the side of his brother-in-law, the superintendent. Hoping to inculcate safety ideas in the young brakeman's mind, Foster puts him on the safety committee. Bob is in the habit of drinking on the sly. He does not get drunk and his fellow employes are not aware of the habit. In a dramatic scene, Bob's sister endeavors to make him see that men engaged in hazardous employment should maintain habits that will ensure a perfectly normal physical and mental condition at all times, which to her mind is a "rule of reason." Neglecting to close a switch one day, after he has let a train in on a yard track, and falling asleep because of his improper indulgence, Bob dreams that a frightful yard collision occurs through his neglect. Awakening from his dream with a start and stricken with fear and horror, he stumbles forward and throws the switch to proper position, and then to his great relief finds the train still safe. But he has had his lesson, and thereafter mends his ways.

Two excellent safety-first reels which have been produced under the auspices of the Secretaries of States and the Police Departments are "Careless America" and "Safety-First." "Careless America" deals with automobile accidents from the public's viewpoint. In a spectacular manner it shows what is likely to result from crossing the streets without taking the necessary precautions to ensure protection from passing motor vehicles. This life conservation film is also of educational value to chauffeurs.

"Safety-First" introduces the Secretary of State for New York, Francis Hugo, head of the world's largest vehicle bureau, and views of the continuous stream of cars on New York's Fifth Avenue. We are now informed that of the 75,000 chauffeurs in New York, sixty per cent are foreigners. We are shown the road test and the written examination which the driver in New York state must pass in order to obtain a license. Next follows a safety-first talk which is given every week to the drivers of a New York department store. The road test given to every woman enrolling as an ambulance driver is convincingly presented.

"Careless America" and "Safety-First" are distributed by the Universal Film Company through their local branches. The former reel is obtainable at the cost of transportation only, while for the latter $2.00 per day is charged.

There are also other safety-first subjects in movie form, with rentals as high as $10.00 per per-

formance. But there is no object in the company incurring such an expense when there are excellent safety-first reels available at the cost of distribution, produced by educational institutions with the sole object of reaching as large a number of drivers as possible.

Unless the company has a portable projector and can therefore screen the pictures in a room in their own building, the best way to save the expense of obtaining the necessary equipment is to rent the local photoplay theater for an hour in the morning.

To cut the operating expenses the company should get other local concerns interested in the scheme, for it involves no more trouble or expense to show motion pictures before a large audience than before a small audience.

A Summer Use for Your Roof

BY R. B. MATEER

(The combination of fresh air and exercise with the business of the day is no longer to be a monopoly of the postman. A public utility company, recognizing the fact that the health and poise of its employes is a double blessing, has turned its roof into a drill ground and added a hiking club to its list of employes' activities. The plan and its success are described below. The author is connected with the commercial department of the Philadelphia Electric Company. —The Editor.)

The increasing realization of the importance of physical health in all branches of human activity has resulted in varied and continued efforts to improve the physical standard of the world's workers. At first these plans emanated chiefly from governments in the form of laws limiting the hours of labor, providing for ventilation and proper equipment, and so forth. More recently, however, there has been a growing tendency among large concerns to take this matter into their own hands and inaugurate various schemes for the better health of their employes.

Daily setting-up exercises on the roof are led by Captain Mateer. Good-fellowship and good health are the aim.

On the Roof —

Among recent undertakings of this kind is that of an enterprising public utility which has initiated at its general offices, under the auspices of its Athletic Association, a daily class in "setting up" exercises. The time is from 12.05 to 12.20 p.m.; the place is the tile roof of its nine-story office building.

As the place is not suitable for close order drill, or marching at quick or double time, "setting up" exercises tending to all-round development are employed. Those generally used are such as affect the extensor and flexor muscles. No portion of the body is exercised continuously—an arm or shoulder exercise being followed by a trunk exercise and it in turn by a leg or neck movement. The classes have been well attended and the members have shown noticeable improvement in carriage and alertness.

In the Field —

As a further experiment in this direction the members of the class were invited to a "hike," and turned out in full force. After an hour or more of rambling through the country, they spent the remainder of the afternoon on the grounds of the Athletic Association, some playing golf. The success which attended this venture resulted in "hikes" being planned for the entire summer.

In addition to the beneficial physical effects achieved by these out-of-door schemes, a marked gain in corporate feeling and interest has been noted. Both individual and corporation profit from anything tending to cultivate that self-reliance and enthusiasm which are essential to effective service.

A blue print poster touched up with colored crayons calls the employes of the Philadelphia Electric Company to a Get-Acquainted Hike.

High Power Factor Induction Heaters

BY C. EDWARD MAGNUSSON

(The use of induction heaters has hitherto been greatly limited by the fact that they displayed a poor power factor and emitted an annoying humming noise which it seemed impossible to remove. Both of these defects have been practically eliminated by a new design recently perfected, as indicated in the test data presented below. Some of these heaters have been in satisfactory use for over eighteen months. The author is professor of electrical engineering at the University of Washington.—The Editor.)

Induction heaters have been on the market for a number of years, but their use has been limited, mainly on account of two undesirable features—low power factor and the humming sound produced. The handicap of an 80 per cent or even lower power factor, as is the case in most induction heaters, has proved too great for successful competition with the resistor type having unity power factor at all loads. Moreover, the alternating flux produced vibrations giving a disagreeable humming sound, which practically excluded heaters of the induction type from residences and other places where noises would be objectionable.

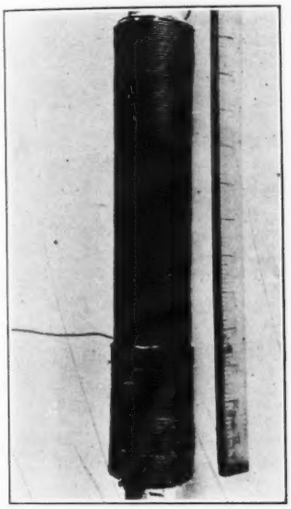


Figure I.—A 1200 watt, 225 volt, 60 cycle induction heater. The scale shown at the right is in inches.

No. 1. A 500 watt, 240 volt, 60 cycle heater, similar in design to Fig. 1.
Core: 1 inch (25mm.) standard iron pipe.
Secondary: No. 22 bare copper sweated with solder.
Primary: 3300 turns of No. 20 copper wire.

Volts	Amperes	Watts	Power factor in %	Temp.
240	2.19	508	96.6	50°C.

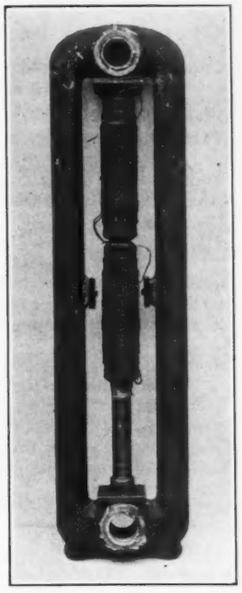


Figure II.—A 2000 watt, 240 volt, 60 cycle induction heater. The simplicity of the design is to be seen in this radiator. As the water gets warmer less current flows for a given voltage, but the power factor remains practically constant. The temperature of the water in the pipe affects the resistance of the secondary winding. The warmer the water, the higher the resistance and hence, the less current will flow for a given impressed voltage; but the power factor stays practically constant.

No. 2. A 1200 watt, 225 volt, 60 cycle heater, Fig. I.
Core: 1 inch (25 mm.) standard wrought iron pipe.
Secondary: No. 22 bare copper sweated with solder.
Primary: 1704 turns of No. 18 "deltabeston" insulated copper wire.

Volts	Amperes	Watts	Power in %
219.0	5.44	1135	95.3
225.0	5.66	1210	95.2
226.0	5.56	1200	95.5

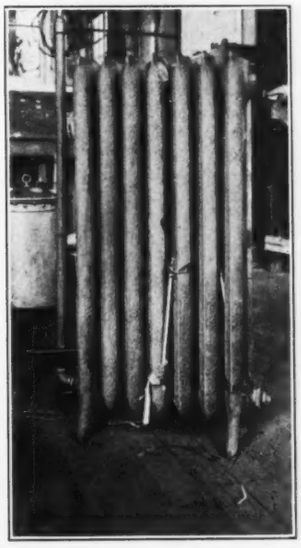


Figure III.—A 2000 watt, 240 volt, 60 cycle induction heater in a water radiator. The result of the test is given in the accompanying table. Note the thermometers attached.

No. 3. A 2000 watt, 240 volt, 60 cycle heater. Fig. III.
Core: 1 inch (25mm.) standard wrought iron pipe.
Secondary: No. 24 bare copper sweated with solder.
Primary: No. 18 copper wire wound in two coils of 1480 turns each.

This heater was inserted in a three-column Rococo water radiator, Fig. III, and tested, with results as given in the following table.

Time	Volts	Amp.	Watts	Per cent	Room	Temp., Deg. C. Radiator Bottom	Radiator Top
10:30	240	9.9	2315	97.5	21.5	22.5	24.0
10:30	240	9.5	2190	96.1	21.5	23.0	34.2
10:40	240	9.25	2140	96.4	21.6	30.0	43.5
11:00	240	9.1	2100	96.3	21.5	40.0	54.5
12:00	240	8.8	2030	96.2	21.8	58.0	72.0
1:00	240	8.7	2010	96.2	22.2	68.0	82.0
2:00	240	8.65	2000	96.4	23.4	70.0	82.8

By means of a new design (U. S. patent 1,260,564) the undesirable features have been eliminated and, moreover, the life of the heater has been increased and the cost of manufacture reduced. Induction heaters of an extremely simple design may now be constructed at low cost, which are practically noiseless and which operate at 95% or even higher power factors.

Design and test data are given for five heaters adapted to household service. In each the iron pipe through which the heated water flows forms the transformer core. The secondary of the transformer

consists of a single layer of copper wire wound in a tight helix around the iron pipe and sweated with solder into a continuous sheath. Thus the secondary winding consists of one turn of low resistance in contact with the iron core. The primary is made of asbestos insulated copper wire wound tightly around the secondary.

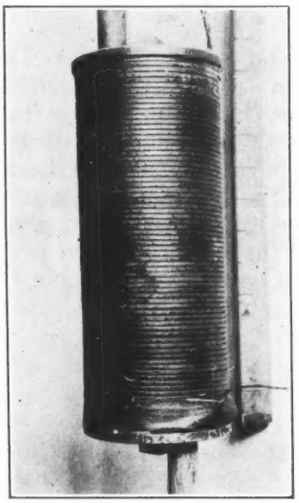


Figure IV. — An "instantaneous" type induction heater — 2300 watts, 110 volts, 60 cycles. The scale is in inches. This heater is for intermittent service, heating the water as it is drawn from the faucet.

No. 4. An "Instantaneous" type. 2300 watts, 110 volts, 60 cycle. Fig. IV.
Core: 3 inch (76 mm.) standard wrought iron pipe.
Secondary: No. 22 bare copper sweated with solder.
Primary: 440 turns of 45 x 125 mil. "Salamander" insulated wire.

Volts	Amperes	Watts	Power in %
110.0	21.97	2290	94.9
110.0	21.62	2290	96.2
113.2	22.62	2420	94.5
112.0	22.52	2410	95.5
111.8	22.42	2370	94.6

This heater is for intermittent service, heating the water as it is drawn from the faucet.

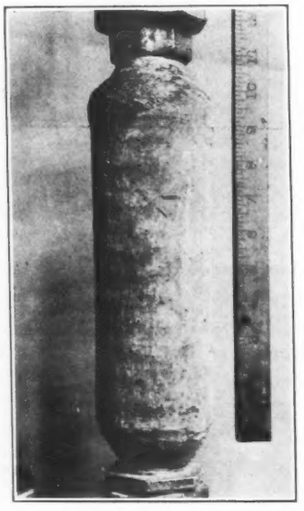


Figure V. — An induction heater of 2800 watts, 225 volts, 60 cycles. The accompanying scale is in inches. Heaters of this type were used at the Puget Sound Navy Yard for heating drafting rooms. The sound given out by these heaters was barely audible and in no way annoying.

No. 5. A 2800 watt. 225 volt, 60 cycle heater. Fig. V.
Core: 1½ inch (38mm.) standard wrought iron pipe.
Secondary: No. 21 bare copper sweated with solder.
Primary: 800 turns of No. 14 (asbestos insulated) copper wire.

Volts	Amperes	Watts	Power in %
220.0	12.91	2700	95.0
225.0	13.20	2830	95.5
227.0	13.36	2880	95.1

The primary winding was impregnated and coated with sodium silicate.

Heaters of this design have been used in the Puget Sound Navy Yard at Bremerton, Wash., during the past eighteen months for heating drafting rooms. Each heater will keep a 60 sq. ft. hot water radiator between 190° and 200° F. The sound emitted by these heaters was barely audible and caused no inconvenience to the draftsmen.

A BOILER TEST WITH POWDERED FUEL

(The question of fuel for use in industrial plants has always been a much-debated one in regions where coal is scarce or of poor grade. Interesting results have recently been obtained in Vancouver, B. C., from tests made with powdered coal, and are printed below. The material used in these tests was of a grade very much inferior to the California coals.— The Editor.)

Date	April 7, 1919
Location	B. C. Sugar Refining Co., Ltd., Vancouver, B. C.
Make and Type of Boiler	Badenhausen Vertical Water Tube
Object of Test	Efficiency, Rate of Evaporation, and General Results.
Duration of Test	6 hours
Fuel:	
Kind	Vancouver Island, Nanaimo, Bituminous, Slack.
Analysis	Moisture 1.1%, V.C.M 32.8% F.C. 37.7% Ash 28.4%, B.t.u. 9364
Pulverized	81.1% through 200 Mesh 95.25% through 100 Mesh
Wt. of Coal as Fired	16,824 lbs.
Water:	
Wt. of Water Fed to Boiler	122,345 "
Temperature Feed Water Entering Boiler	177 degrees
Temperature Feed Water Entering Economizer	85 "
Steam:	
Pressure by Gauge	71 lbs.
Superheat	Boilers designed for 10° or 12° superheat, but not considered in this test.
Factor of Evaporation	1,068
Hourly Rates:	
Dry Coal per Hour	2,707 lbs.
Water " " Actual	20,390 "
Water " " F. & A. 212°	21,776 "
Capacity:	
Boiler h.p. Developed	631 h.p.
Rated Boiler h.p.	504 "
Percentage of Rated Capacity Developed	125%
Economy Results:	
Actual Evaporation per lb. of Coal as Fired	7.5 lbs.
Equivalent Evaporation per lb. of Coal as F. & A. 212°	8.04 "
Efficiency:	
Combined Boiler and Furnace Efficiency Based on Coal as Fired	83.3%
Flue Cases:	
Temperature of Escaping Gases from Boiler Average	500 degrees
Temp. of Escaping Gases from Economizer	285 "
Analysis of Gases CO_2 by recording apparatus Average	13%
O, by Orsat apparatus	6 to 8%
CO, " " "	None
Smoke—Very light white haze.	
Draft—Over fire ¼ in.; at stack ⅝ in. to ¾ in.	
Furnace Temperature—2200° to 2540°. Average	2425 degrees

Notes

The boiler after being in operation 3 weeks showed no accumulation of slag, or ash in tubes or furnace. The ash deposited in the bottom of the furnace was easily removed. The fine ash in the dust chambers was removed weekly. Small turbine driven fans provided sufficient air to carry the fuel into the furnace. Part of the air for combustion was admitted through the damper doors in the furnace front.

"CO_2" readings were taken continuously by Simmance-Abady recorder. Oxygen readings were taken on Orsat apparatus. The feed water was weighed in the tank and supplied to the boiler through a separate pump with all connecting lines blanked off.

Furnace temperatures were taken with "Tycos," Fery radiation pyrometer (Taylor Instrument Co.). The calorific value of the coal was determined by the calorimeter test— G. S. Eldridge & Company, Vancouver, B. C.

The complete equipment was designed and installed by the Fuller Engineering Company, Allentown, Pa., U. S. A.

Notes on Suspension Insulator Design

BY H. L. GARBUTT

(The necessity of adapting insulators produced under factory conditions to conditions as they actually exist in practice on the Pacific Coast has led to a careful analysis of deterioration causes and to a suggested modification of insulator design. The results of tests upon these modified forms are here presented with the encouraging outlook of improved service as a possibility. The author is the recently appointed San Francisco supply manager of the Westinghouse Electric & Manufacturing Company and was formerly associated with insulation research work with that company.—The Editor.)

The very rapid development of transmission engineering has often forced the engineer to design insulators for installation on high voltage lines with little previous operating experience of any kind as a basis, and with no service data of the operation of insulators at the voltage for which the insulator was being designed. As the amount of power transmitted and the distances of transmission increased, it was necessary from an economical standpoint to raise the voltage of the line accordingly. Above 66,000 volts the older designs of the pin type insulators were unsatisfactory because of mechanical and electrical characteristics and the cost. Also, the quality of the porcelain body of the pin type insulators installed on the early high voltage lines was much inferior to the quality of the present insulator body.

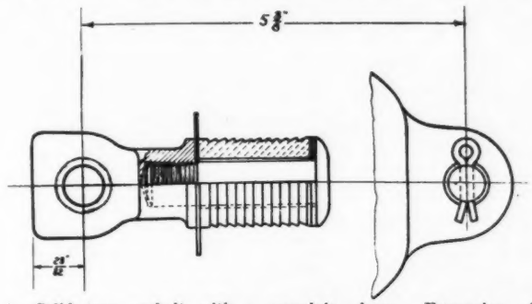


Fig. 1.—Solid type eyebolt with a porcelain sleeve. Expansion of the eyebolt will not apply mechanical stress to the porcelain.

Moreover, the factory tests made on the individual shells and on the assembled insulators were based on a percentage of line voltage instead of on flashover voltage. In fact, in many cases the test voltage on an assembled unit consisting of three pieces of porcelain was less than the test now applied to individual shells of such a unit. The large number of failures that occurred on the lines insulated with the early designs is now a matter of well known history.

The suspension insulator string, consisting of a number of units of low cost joined in series, apparently offered the best possibilities as regards cost of the insulator, ease and cost of installation, etc. The link type of suspension unit and the cap and pin type were advocated by different engineers, some favoring one type and some the other. From considerations of factory production, ease of installation on the line and replacement on the line, and other factors well known to the transmission engineers, the cap and pin type suspension insulator was rather generally adopted.

Theories of Suspension Insulator Deterioration —

The deterioration of cap and pin type suspension insulators is well known to the operating engineers and the manufacturers of electrical porcelain. Numerous technical papers have been published in the engineering periodicals expressing the opinions of operating engineers, the opinions of research engineers of manufacturing companies and the opinions of professors of the technical universities. These opinions are fully discussed in the Transactions of the A. I. E. E., 1910 to 1918, inclusive, and will not be mentioned here except in a rather general summary.

An analysis of these technical papers gives four main theories to express the deterioration of the cap and pin type suspension insulator.

1st. The porcelain body between the cap and pin absorbs moisture until the resistance of the unit is so low that the voltage across it is extremely small or the porcelain punctures under normal operating voltage. In either case practically the entire electrical stress is impressed on the remaining units in the string.

2nd. The insulator unit consists of a metal cap and metal pin assembled to a porcelain by means of neat Portland cement. These three materials have different temperature coefficients of expansion, the metal parts having the highest coefficient and the porcelains the lowest. The ratio of coefficients is approximately 4 to 1. The changes of temperature, both gradual and sudden, tend to apply stresses to the porcelain and cause cracking. It is generally considered that the cap causes the least trouble as regards cracking of the porcelain between cap and pin. However, in the early designs the cap was allowed to rest on the porcelain rain shed with the result that the sheds were often pushed off.

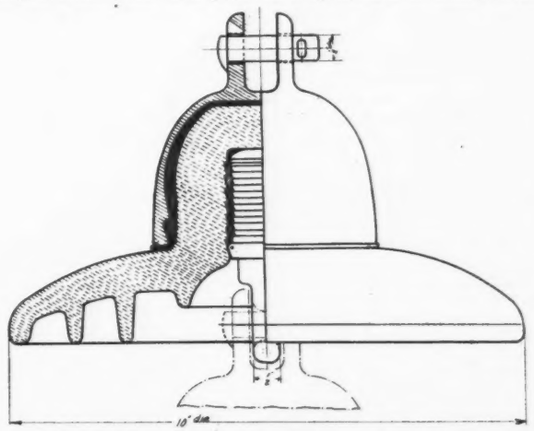


Fig. 2.—The porcelain sleeve eyebolt of Fig. 1, assembled. The temperature coefficient of the sleeve and insulator will be the same.

3rd. The insulators may stand temperature changes satisfactorily when first placed in service. However, the cement may continue to set after installation of the unit in line service and crystallization may take place with a slight enlargement of the cement section. The expansion of the metal pin would then apply a stress to the porcelain during temperature changes sufficient to cause cracking.

4th. The insulator unit passes through daily and seasonal changes of temperature. During these changes the cement must at times pull away from the surface of contact with the metal. Films of salt formation are formed in the air space left between metal and cement. When the temperature cycle has returned to the condition where cement and

metal were previously in contact there will be additional stress applied to the porcelain, due to this film of salt formation. The thickness of the film would increase with the number of cycles and ultimately cause failure of the unit by cracking the porcelain.

Suggested Modifications of Design —

With these theories in mind, two modifications of the customary solid type of eyebolt were proposed:

1st. Eyebolt having a porcelain sleeve shown in detail in Fig. 1, and assembled with porcelain in Fig. 2. As evident from the detail drawing, transverse and longitudinal expansion of the metal parts of the eyebolt will not apply mechanical stress to the porcelain. The temperature coefficient of expansion of the sleeve and insulator will be the same.

2nd. Eyebolt having pressed metal sleeve shown assembled with porcelain in Fig. 3. Here the expansion of the metal pin is taken care of by the slight air space between

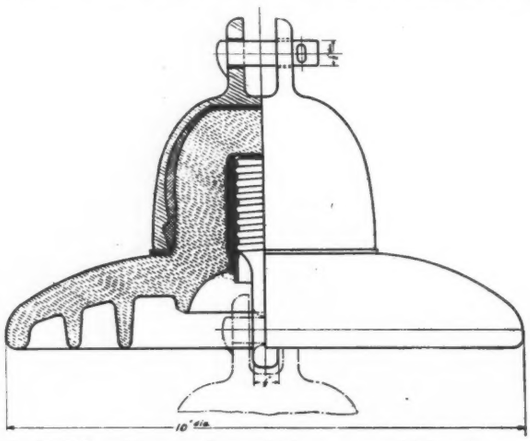


Fig. 3.—Eyebolt with pressed metal sleeve, asssembled with porcelain. The expansion is taken care of by the slight air space.

eyebolt threads and the thimble, the resilient washer at top of eyebolt being of assistance in minimizing stress from longitudinal expansion of the pin.

Tests to Determine Comparative Resistance to Temperature Changes —

The effect of stresses as outlined under Theory 2 was determined as follows:

Two water baths were maintained at 98° C. and 4°C. and the insulators plunged from one to the other. Insulators having the customary type of eyebolt shown in Fig. 4 and insulators having the suggested modifications of eyebolt design were put through the same cycles of test. The units were plunged into the water, cap first, transfer between baths being made as quickly as possible. The first ten cycles were according to design test specifications of one of the large purchasers of suspension insulators. Each cycle consisted of four changes, the insulators being first plunged into the hot bath and allowed to remain one minute. They were then plunged into the cold bath for a period of three minutes, back to the hot water for one minute and again to the cold for one minute. After each cycle of four plunges the units were tested to flashover voltage. The severity of the cycles was gradually increased. The number of cycles and the severity of the cycles to which the insulators were subjected, and the order in which the cycles were given, are tabulated below.

TABLE 1 — TIME IN MINUTES

Test No.	No. of Cycles	Hot Water	Cold Water	Hot Water	Cold Water
1	10	1	3	1	1
2	5	1½	3	1½	1½
3	5	2	3	2	2½
4	6	3	3	3	3
5	3	4	4	4	4
6	2	5	5	5	5
7	2	7	7	7	7
8	4	10	10	10	10

Failures According to Cycles —

The comparative ability of the various designs in resisting this test of increasing severity is shown in Table 2. The insulators in Batch A (Fig. 4) have a solid metal eyebolt cemented directly into the porcelain. The insulators of Batch B (Fig. 2) have an eyebolt of porcelain sleeve type (Fig. 1) cemented into the porcelain. The insulators of Batch C (Fig. 3) have an eyebolt of pressed metal sleeve type cemented into the porcelain.

TABLE 2

	Batch	No. of units tested	1	2	3	4	*5	6	7	8	No. still intact
Solid	A	16		1		4	5		2	2	2
PorcelainSl.	B	14						1	2	6	5
Metal Sleeve	C	14									14

In Table 2 the failures due to temperature changes are roughly grouped under the various tests, that is, no account is taken as to which particular cycle of a certain severity the unit failed under. Batch A, having the solid eyebolt cemented directly into the porcelain, started to fail much earlier than either of the other types. Batch B (porcelain sleeve type) showed a very decided advantage over the type having the solid eyebolt. In fact, no failure

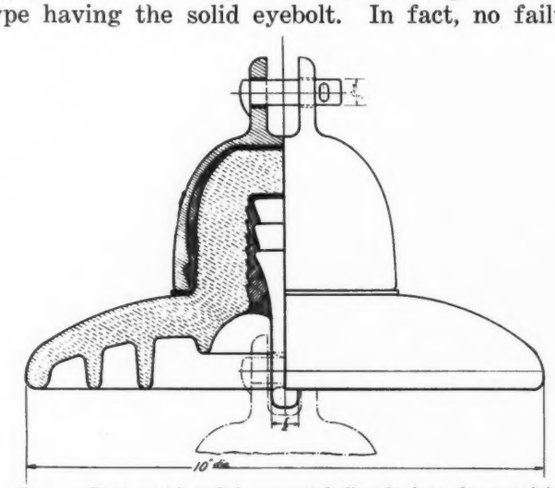


Fig. 4.—Solid metal eyebolt cemented directly into the porcelain

occurred until the cycle of temperature changes was made very severe (5 minute periods). Only three failures occurred until 10 minute periods were reached. It is believed that the cycle of even 5 minute periods is so much more severe than any of the daily or seasonal changes that will be experienced in line service that little emphasis should be placed on failures occurring in cycles of longer than 5 minute periods.

The insulators in Batch C (metal sleeve type) showed a very decided advantage over the units having a porcelain sleeve type of eyebolt as well as over units of the solid eyebolt type. In fact, no failures occurred up to and including 4 cycles of 10 minute periods. It was considered impractical to continue the tests to a cycle of longer periods.

Electrical and Mechanical Characteristics —

The dry and wet flashover voltages of the three designs are practically identical. The ultimate mechanical strength in tension of the three types ranged from 9000 lbs. to slightly over 10,000 lbs., the solid eyebolt type having a slightly higher value. However, it is believed that slight changes in the designs of the eyebolts having porcelain sleeves or metal sleeves will bring the mechanical strength of the three types to practically the same value.

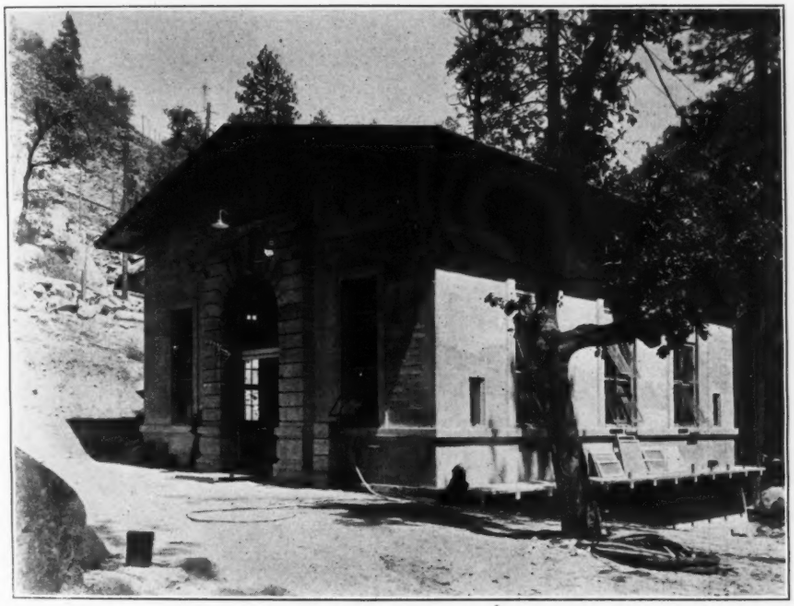
Conclusions —

Probably the porosity of the porcelain body of suspension insulators outlined under theory 1 has been the cause of failure of a large number of insulators in the past. During the early days of transmission engineering, the majority of engineers preferred an insulator having a porcelain body which offered a high resistance to mechanical breakage. As a consequence, the porosity of the material, which varies inversely to the mechanical strength as regards resistance to mechanical impact, was considered of secondary importance.* The more thorough knowledge which the ceramic engineer now has of the characteristics of body ingredients and more painstaking factory control should practically eliminate porous ware in the future.

The advantages of the modifications of eyebolt design either of the porcelain sleeve or metal sleeve types are very apparent as regards laboratory tests of temperature changes. The metal sleeve design apparently resists the changes better than the porcelain sleeve design, but the cycle of test under which the insulators having eyebolts with porcelain sleeves started to fail was probably much more severe than the conditions met with in line service.

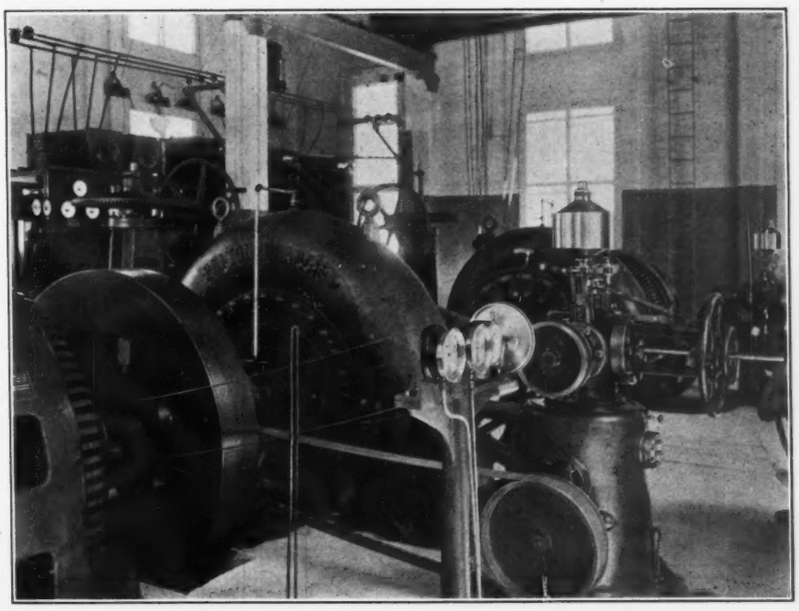
It is rather apparent that the laboratory tests made on these insulators should give comparative data as regards the ability of the various designs in resisting sudden temperature strains. Obviously, the stresses that would be placed in the porcelain by changes according to Theories 3 and 4, cannot be satisfactorily duplicated in the laboratory. However, it is believed that either of the suggested modifications will materially lessen the probability of failures that may be caused according to these theories. This should be especially true of the metal sleeve design, since any very appreciable stress will distort the metal thimble and thus equalize the stress on the inside of the porcelain cap.

*See Electric Journal, March, 1918.



YOSEMITE VALLEY POWER PLANT

The plant which supplies the Yosemite Valley with power is located at the Cascades, just below the valley proper. It has a capacity of 2000 kw. with a present output of 1000 kw. This supplies all valley lighting, as well as the extensive electrical cooking and power installation at Camp Curry. Two hotel type electric ranges, a 3 kw. toaster, an electric bake oven, three dishwashers, a griddle, a rotary saw, as well as other smaller appliances are among the electric equipment at this camp.



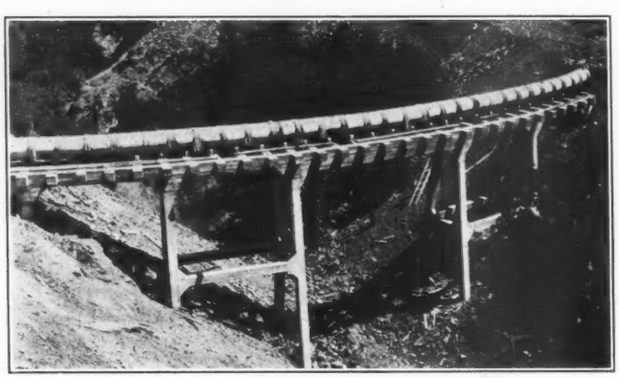
Two 1250 kva. G-E 2300 volt, 30 cycle, 3 phase a.c. generators direct connected to a 1500 h.p. Pelton Francis turbine furnish the power. The exciters are 10 kw., 1250 v. direct connected. Three transformers, oil cooled, of the outdoor type; 60 cycle, 400 kva., located at the plant step the current up to 11,000 voltage, at which it is transmitted to the valley. The ordinary voltage for valley use is 2300 v.

Construction Details on the Marin Water and Power Project

BY H. M. BOWERS

(Cost and reconstruction data on the recently completed Alpine dam in Marin county, California. An 8700 ft. tunnel and interesting problem in pipe line construction over hilly country form two of the special features here taken up. A general description of the dam itself appeared in the April 1st issue of the Journal of Electricity. The author was assistant engineer on the work, in charge of office detail, designing, detailing and estimating.—The Editor.)

Pine Mountain tunnel, which divides the pipe line into two divisions of about 3½ miles each, is 8,700 feet long, has a cross section of horseshoe shape and of about 54 square feet, net area. It is concrete lined throughout its length, the lining being 6 inches thick theoretically, over most of the length, but increasing to 12 inches near the portals and where the surrounding material is soft. Concrete inlet and outlet structures are provided at the portals. The contract for the tunnel was let to McLeran & Peterson of San Francisco and work was begun in December, 1916. Excavation was carried on from



Curves on the concrete pipe line were made by the combination of straight and beveled sections, trestles being necessary for bends more acute than the limiting 75°.

both ends and at such a rate that the headings met at the end of February, 1918. Lining was done under a sub-contract, by Cahill-Vensano Company of San Francisco, the principal contractors furnishing all material.

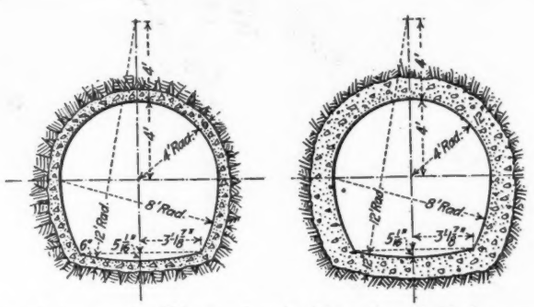
Tunnel Costs

Complete data of the cost of the tunnel are not available, but from memoranda kept by the engineers in charge of the work the writer has deduced a few figures which may be of interest, though in each case they give the cost of labor only. From these memoranda it appears that the cost of labor alone for excavating and timbering (about 25% of the tunnel required some timbering) was $14.18 per lineal foot, and that the cost of lining was $5.07 per lineal foot, making the cost of labor for both excavation and lining $19.25 per lineal foot. The average cost of labor for timbering was $1.85 per lineal foot for the entire tunnel, but for the portion actually timbered the cost was $7.55 per lineal foot. Rock for the concrete lining was quarried and crushed at the east portal at a cost for labor of $0.73 per cubic yard of crushed rock. The cost of labor for lining the tunnel was $5.25 per cubic yard, including quarrying and crushing of rock, or $5.07 per lineal foot, as above. The volume of concrete placed in the lining was 0.9640 cu. yd. per lin. ft. (0.8372 for top and sides and 0.1268 for the invert). As the volume required for a lining 6 inches thick would have been 0.5807 cu. yd. per lineal foot the overbreak was 0.3833 cu. yd. or 66%.

Compressor Plant Equipment

The tunnel was driven largely through black serpentine in which basalt boulders were frequently encountered. In places the formation was basalt and hard shale with seams of serpentine. Occasionally green serpentine was encountered. The tunnel may be considered a dry one, as water caused but little difficulty. A little trouble was caused by natural gas. Powder used for blasting was 40% nitroglycerine of which the quantity used was nearly 9 lb. per lineal foot, or 3 lb. per cubic yard.

Because of the inaccessibility of the west portal of the tunnel the compressor plant was placed on the county road at a point about 1000 feet from the east portal and about two miles from the west portal. Air was piped to the portals through 3½ inch pipe lines. The plant consisted of three 25 h.p. Fairbanks-



Section of the tunnel. This was largely driven through black serpentine in which basalt boulders were frequently encountered.

Morse Y type semi-diesel engines and three 8 by 8 inch Sullivan compressors. A pressure of 100 lbs. per sq. in. at the plant was maintained and about 300 cu. ft. per minute of free air was compressed. Legner drills with sets of steel ranging to 8 feet in length were used for driving the tunnel. Jackhamers were used for trimming.

Concrete Pipe Line

To convey the water from the reservoir to the distributing system reinforced concrete pipe lines, 24 inches in diameter and with walls 3 inches thick, were used. The pipe was cast in sections in a pipe yard at Fairfax, in special steel forms made for the purpose. For reinforcement, collapsible spiral cages made by the American System of Reinforcing, Los Angeles, were used. The circumferencial wire is ¼ inch in diameter, the pitch of the spirals is 3.3 inches in the second division where the static head is 40

feet, and 4.71 inches in the first division where the head is less than 30 feet. The pipe is laid in a trench 4 feet deep, excavated along a bench which was cut into the hillside for the main purpose of providing for the pipe line, but with the idea that a permanent roadway of considerable scenic merit may be maintained along the bench.

Handling Curves

The maximum curvature adopted for the pipe line was 75° on a basis of 50 ft. chords. The pipe is made in sections 3 feet long and to provide the curves, beveled sections, that is, sections shorter on one side than on the other, were used. To cast these a special top ring for the forms had to be made. To avoid the necessity of numerous beveled sections with different degrees of bevel only such degrees of curvature were used as could be made of combinations of straight line sections and beveled sections of the same amount of bevel. For instance, a 75° curve was made of beveled sections, a 50° curve was made by alternating two beveled sections with one straight line section and a 25° curve was made with two straight line sections and one beveled section.

As the country is hilly the limiting curve of 75° would not fit into all of the gulches along the line and the pipe had to be carried across these gulches on the trestles. These trestles were made of reinforced concrete and were of various spans according to the heights of bents required. The road runs around the trestles on such curvatures as were required to fit the gulches.

Personnel in Charge

All trenching and backfilling, building of trestles and gate houses and supply of valves were done by the District. The pipe was made and laid by Bent Bros. of Los Angeles, contractors, under the direction of their superintendent, J. G. Tripp.

Other features of the work which were done by contract were: clearing the reservoir site, changing about 4 miles of county road which passed through the reservoir site, excavation at the dam-site, excavation of a small tunnel on the pipe line, excavation of 7 miles of road along the pipe line grade.

During the entire progress of the work M. M. O'Shaughnessy was consulting engineer. At the time of its inception A. R. Baker became engineer of the District, as was stated above, and continued in that capacity until the work was completed. After the bonds were sold the writer became assistant engineer in charge of all office work—designing, detailing, estimating, etc. Division engineers on the work were C. T. Broughton in charge of the excavation of Pine Mountain tunnel and of trestle building and tunneling for the pipe line, Charles Brown in charge of the construction work at Alpine Dam, R. S. Hannis in charge of road work, lining of Pine Mountain tunnel and of trench excavation, and C. S. Robinson in charge of trenching and trestle building. The construction work had been completed and was turned over to the operating department on January 31, 1919. The District is operated by John Burt, general manager, San Rafael, California.

Western Ideas

THE NEWEST INDIRECT LIGHTING FIXTURE is the iron helmet. This is not a joke, but a practical idea; one moreover which has been successfully carried out. A helmet equipped with an X-ray reflector, suspended by chains, and wired up, proved to be a window display attracting wide and immediate attention. Moreover, it led to the prompt sale of chains and reflectors to the general public who also had returning soldiers, and consequently iron helmets, in the family.

With two million soldiers, accompanied by helmets, returning to the States, this ingenious idea is of no small value. Not one of them will want to part with this memento of his adventures, and the notion of utilizing it as an effective fixture, conspicuous but never in the way, is one which will inevitably appeal to his orderly and artistic women-folk.

For a window display a borrowed helmet may be used, and considerable interest added by a card describing some of its adventures. When the passers-by gather, most of them will decide that this is the true vocation of returned helmets and promptly provide themselves with the necessary apparatus for completing the fixture.

WHAT SALES MANAGERS SHOULD KNOW is the substance of the following tabulation by B. S. Cutler, Chief of Bureau of Foreign and Domestic Commerce, which appeared in a recent number of Advertising and Selling. Mr. Cutler believes that personality is not the only important factor in selling, but that a thorough acquaintance with the conditions of the market are essential. He says:

About an old or new market for an old or new commodity, I want to be continuously informed on the following points.

a. Population figures.
   1. Racial predominance.
   2. Percentages of other racial stocks.
   3. General literacy or state of public education. (A very vital point in advertising, display methods, personal approach, etc.)
   4. Predominant employment, whether industrial, agricultural or mercantile.
   5. Percentages of other vocations and professions.

b. Purchasing power per capita.

c. Character of banks, whether liberal or conservative.

d. Merchandising customs.
   1. Character of stores, whether department stores, or shops, or other sales methods.
   2. Payment habits, whether by cash or credit predominantly.
   3. Local delivery requirements.
   4. Use of sales floors or warehouses. (That is, do the merchants put the greater part of their stocks in one place or the other; some display only a few samples and deliver from warehouse.)
   5. The use of advertising mediums and outside solicitation.

e. Banking facilities.
   1. Are the banks primarily absorbed in financing crops or factories?
   2. Are they generally conservative or liberal? (This has a bearing on the individual purchasing ability, if ready money awaits the marketing of crops or can be borrowed in anticipation of them.
   3. The extent to which banks or other financial agencies accept mortgages on real estate. Liberality in this respect creates more fluid conditions of purchasing power amongst the public and stabilizes local conditions.

f. Transportation facilities.
   1. What water, rail and trolley lines exist and carry package freight. (On this question hinges much of the marketing problem in the smaller commodities since they are readily distributed over a wide radius from warehouse centers.)

These questions might be elaborated or modified according to the commodity involved. They are suggestive mainly of an attitude of respect for the facts in the case. Certainly they can not be neglected by a manager who must reduce to a minimum the overhead costs of failure.

Water Supply and the Public Lands

BY W. B. HEROY

(The basis for the acquiring of water rights and power privileges in the great blocks of public lands soon to be thrown open to the public in California and Oregon is here explained in the first of a series of articles dealing with the classification of public lands and the acquiring of water power and right of way privileges. The author is connected with the Land Classification Board and the article is published with permission of the Director of the U. S. Geological Survey.—The Editor.)

The dominant factor in the development and use of the remaining public lands is water, not only surface water, but underground water and rainfall. The future extension of agriculture and grazing in the public-land states is directly dependent on the distribution of moisture, for, as a rule, the remaining public lands of the West are arid or nearly arid. The development of the mineral industries, of power, of transportation, and of manufacturing in this region are all intimately related to water supply.

From these premises it follows that an efficient organization for the disposal or administration of the public lands must have fundamentally an appreciation of the importance of this subject, and must include a technical force trained to obtain and make accessible to administrative officers and to the public the required data.

The Classification of Lands

The early Directors of the Geological Survey, Clarence King and John Wesley Powell, realized from its inception the importance of hydrologic investigations and for many years cherished the hope that means to do the work might be provided. The efforts of these men were rewarded in the creation by Congress in 1888 of an irrigation survey, and the systematic investigations of surface and underground water then begun are being continued at the present time.

Through these activities of the Survey and through the work of the Weather Bureau, which maintains a large number of stations for the collection of rainfall and other climatic data, the Government thoroughly covers the entire field of theoretical and applied hydrology. The usefulness of this work as an aid to public and private engineering enterprises requires no discussion, but the applicability of water-supply data to the solution of many of the problems of public-land administration is less generally understood.

The Basis for Classification

The classification of lands with regard to water supply requires as a basis not only knowledge of the water itself—of its quantity, quality, and distribution, but of the land—its topography, climatic and cultural conditions, and soil. These basic facts must then be studied in relation to the probable uses of the water, and distinction must be made between uses that leave the water essentially unimpaired in quality and undiminished in quantity, as water-power development; those that may impair its quality, as municipal or certain industrial uses, and those that may deplete its quantity, as irrigation. The forecasting of the probable future needs of a region and the consequent formulation of plans for the future use of the available water make a different problem, into which many important factors now unknown or unappreciated may enter. The imperfection of any such plans must be at once conceded, but I think no one will seriously question the desirability of basing comprehensive schemes for future water utilization on the best obtainable information. It is only applying to problems of water supply the same type of engineering foresight that enters into city planning, railway extension, and many similar activities.

Future Development Considered

Plans for the highest future use of a water supply must involve as little sacrifice of present needs and growth as possible. The likelihood of conflict between present use and future development must be carefully considered, the rival claims must be harmonized if possible, and, when an impasse is reached, preference must be given to the higher use. Typical of such conflicts are those arising where effort is made to establish water-power plants in locations such that the subsequent use of the water for irrigation becomes impracticable or unduly costly, or to acquire mineral and agricultural title to lands that are most useful as sites for structures required for water-power or irrigation development.

State and Federal Control

The control of the water as a question of law and administration is an important element in the problem. Under our system of government this control is divided between the States and the Union. To this separation of functions must be attributed much uncertainty, confusion, and economic waste. Though public lands are subject to the control of Congress and their disposition is directed by the legislative branch of the Government, the States, by the enabling acts and the constitutions formed under them, have generally been delegated control over the appropriation of waters flowing within their boundaries, subject to certain paramount rights of the general government with reference to navigation and to the rights of sister States in interstate streams.

Thus application must be made to the State to obtain the right to divert the water of a stream, but the right to convey across public lands is granted by the Federal Government. The public interest has in many cases unquestionably suffered because neither federal nor state officials have exercised authority to control situations that have arisen.

Fortunately many state and federal officials have come to realize that the solution of this difficulty lies not in contention but in cooperation. Much has been accomplished in closing up the gap between federal and state authority in which both have in the past claimed jurisdiction and neither has exercised effective control.

The Business Library

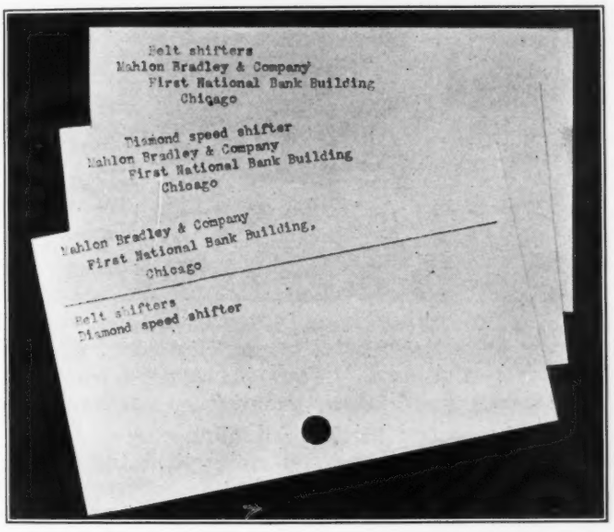
BY LOUISE B. KRAUSE

(What do you do with the trade catalogs which come through the mail? Are your photographs in such order that you can lay your hand on the data you want without a day's hunt? What happens to the cuts which no business establishment is without? The picture of order and system in your office and desk which this article suggests will lead you to revising present systems at once. The author is librarian with H. M. Byllesby & Company, Chicago. Attention is called to the fact that written permission is required to reproduce these articles.—The Editor.)

TRADE CATALOGS, PHOTOGRAPHS AND LANTERN SLIDES—THEIR FILING AND INDEXING

Trade Catalogs —

Several methods for filing and indexing trade catalogs have been advocated by various writers, but the most generally approved practice is to file in legal size vertical file cabinets, with a shelf to accommodate large bound volumes which are too bulky to go into the drawers and whose disposition



Catalogs are as a rule best filed under the name of the company—but these should be subject indexed as well. It takes less time to make a working index than to look through all the catalogs in question.

on shelves instead of in file drawers can not be noted by a symbol on the index card.

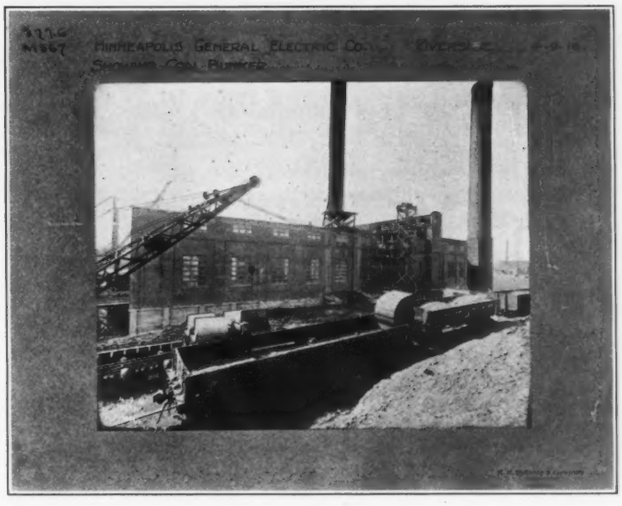
All trade catalogs should be filed alphabetically by the names of the firms issuing them, rather than under subjects, because often a single pamphlet, or volume, may list a variety of materials which can not be classified under a single subject name, thus avoiding numerous cross subject references.

Engineers are prone to endeavor to apply a Decimal Subject classification in filing trade catalogs, with the result that they fall into many intricate difficulties. However, small offices using only a few trade catalogs on special subjects can file under subjects with other library material if desired. (The organization of an alphabetical subject file for miscellaneous data will be fully described in a later article in this series.) All trade catalogs filed under the names of the firms should be subject card indexed, because it takes less time to make a working index than it does to look through various catalogs to find desired information when there is no index.

The method of indexing should be as follows: there should be a card made for the name of each firm issuing the catalog, and the address of the firm may be added to this card in order to use it as a mailing list if desired. The subjects, i. e., specific names of merchandise, which the catalog covers and any well known trade names, should be written on the face of this main card (see illustration) and additional cards made for the subjects and any important trade names, and all of the cards should be filed in a single alphabet. A Cutter number (which will be explained in detail in the article on cataloging) may be put on each index card in order to facilitate the alphabetizing and quick location of individual trade catalogs. The subject index in Thomas' Register of American Manufacturers, an invaluable tool to purchasing departments, is a great aid in selecting subject names to be used in the trade catalog index.

Photographs —

Photographs are important sources of information for any business firm, as they visualize printed

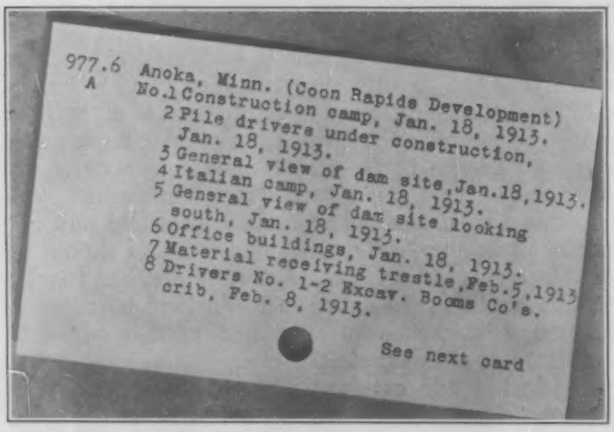


Photographs may be readily filed after mounting. The Dewey decimal classification for each state, with the initial of the city below, provides a convenient method of filing.

or written descriptions and make an accurate and unchangeable record which does not permit of any misunderstanding, as is sometimes the case in reading a printed account. Every industry should have a photograph file illustrating the various aspects of its products or the installations and construction for which it is responsible and which may be supplemented by any photographs which can be obtained on similar work done by firms other than its own.

Banks and investment houses should have photographs of all tangible properties on which they issue securities, as they have been found to be of great aid in making a stock and bond offering concrete in the mind of possible customers.

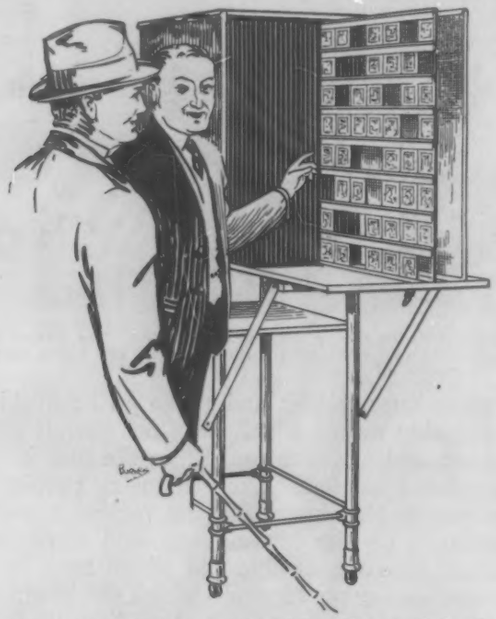
Photographs are best filed by mounting singly or in groups on a standard size photo-mount board 11 by 14 inches and put into architectural size vertical file drawers. A dry mount process by the use of gum tissue and a hot iron is much to be preferred to the ordinary method of mounting, as photographs expand when wet and shrink in drying, thus subject-


977.6
A
Anoka, Minn. (Coon Rapids Development)
No.1 Construction camp, Jan. 18, 1913.
2 Pile drivers under construction,
Jan. 18, 1913.
3 General view of dam site, Jan. 18, 1913.
4 Italian camp, Jan. 18, 1913.
5 General view of dam site looking
south, Jan. 18, 1913.
6 Office buildings, Jan. 18, 1913.
7 Material receiving trestle, Feb. 5, 1913
8 Drivers No. 1-2 Excav. Booms Co's.
crib, Feb. 8, 1913.
See next card

The card index of photographs gives the file number and a record of the photographs in that series, giving as well the date on which each was taken.

ing the mounting board to more or less warping unless heavy pressure is used.

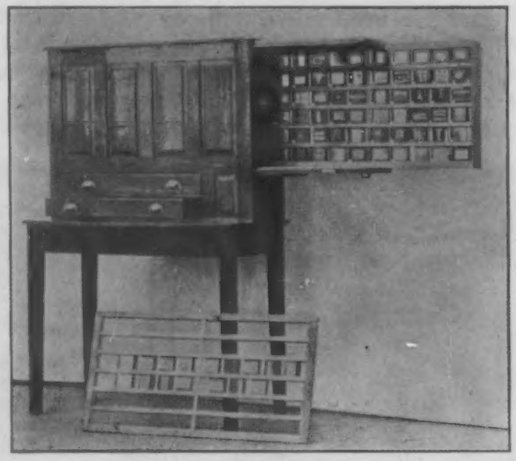
Photographs for business purposes may be filed geographically or by subjects, according to the use which is to be made of them. An engineering firm building structures in different parts of the country file their construction photographs under the name of the state and city in which the work is done; all the cities of a single state are arranged in alphabetical order under the state name. The individual



The vertical filing system for lantern slides. This is designed on the sectional unit plan and may be added to when necessary.

photograph boards are numbered in accession order which makes the photograph of latest date the highest number under each city.

In order to avoid writing the name of the state and the name of the town on the corner of each photograph, this particular library uses on each board the Dewey Decimal Classification history number for each state with the first letter of the name of the city below this decimal number, to which is added the accession number of the photograph. This combined number is used in the corner of the index card on which is also entered the name of the city followed by the accession number of each board and the title of the photograph with the date on which the photograph was taken, as shown in the illustration on the preceding page.



Slides are filed either in similar fashion to cards in drawers or in vertical cabinets provided with grooves which permit of the examination of slides without handling.

Lantern Slides —

There are two methods of filing slides. One is to file slides in a cabinet containing drawers similar to a card catalog case, the slides being filed horizontally rather than vertically. The other method is to use a specially designed filing cabinet containing sliding file leaves which pull out at right angles to the cabinet, which is designed on the sectional unit plan for growth; the leaves have each a capacity of about fifty or sixty slides which are held in place by means of channel grooves which provide for examination of the slides without handling, and also permit of quick removal of each slide as needed. Complete descriptions of such cabinets may be obtained from the Multiplex Display Fixture Company, St. Louis, Missouri, and from G. S. Moler, 408 University avenue, Ithaca, New York. Both makes have been satisfactorily used by a number of business organizations.

The drawer method of filing slides costs less than the cabinet with sliding file leaves, and also takes up less space. It has been found in the experience of libraries handling large numbers of lantern slides which are used freely that they are not as fragile as they appear to be; they do not break easily and can be fingered as rapidly as a card index file in a similar drawer. A piece of white paper can be easily slipped behind the slides in the drawers to bring out their details when they are being consulted.

Lantern slides may be classified and card indexed for business purposes in the same way that photographs are and care should be taken to have the file number and title of the slide plainly lettered along the top edge of the face of the slide.

Collections of lantern slides for art and architectural purposes require more elaborate classification and cataloging but such requirements do not come within the scope of this series of articles.

In some business libraries where the slides are loaned out of the city it may be advisable to index them on a 4 by 6 inch catalog card, instead of the 3 by 5 inch card, in order to allow room to paste on it a photograph of the lantern slide which will show its detail when the slide itself is not immediately available. All lantern slide negatives should be filed separately, in drawers provided for their exclusive use.

Cuts —

Half-tone, zinc and electrotype cuts may be classified in the same way that photographs are, but filed in flat drawers. A reduced photograph of the cut may be pasted on the index card similar to the plan noted above for lantern slides.

Maps —

Business firms having large collections of maps which need to be specially filed and recorded will find helpful suggestions in a small pamphlet entitled "Making Maps Available," by Beatrice Winser, published by the American Library Association, 78 East Washington Street, Chicago, Illinois, price five cents.

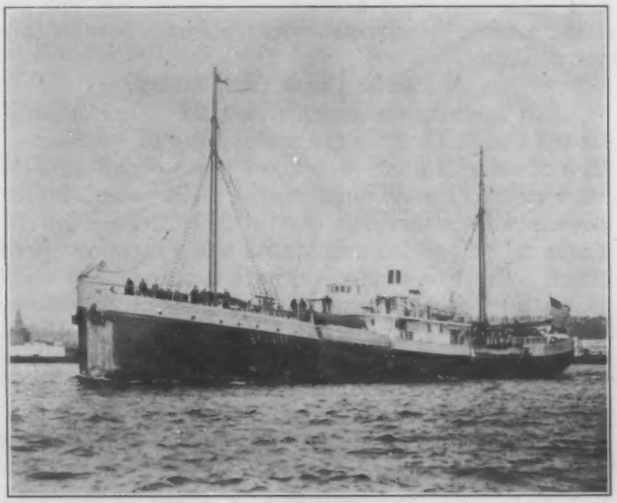
Internal Combustion Engine on the Pacific Coast

BY GEORGE DOW

(The use of the Diesel engine for marine propulsion is destined in large measure to make possible the maintenance of the American merchant marine. Shipping and ship building have come to play an important part in the electrical industry of the Pacific Coast and the following article on the adaptation of the Diesel engine to Pacific Coast needs is of particular interest to the West. The author is of the Dow Pump and Diesel Engine Company of Oakland, Cal., and the paper formed part of the discussion of this subject before the San Francisco Section, A. S. M. E.—The Editor.)

The Diesel Engine from Europe

In 1911 a vessel flying under the Danish flag entered our harbor and discharged cargo at one of our docks. The newspapers announced that a new ship propelled by a new type of engine had entered our port after making a most successful voyage from Copenhagen, Denmark. The local shipping world and the engineering profession crowded into



The motorship "Libby Maine"—a 2000 ton wooden ship with Diesel engines. Her record for speed and endurance has proved excellent.

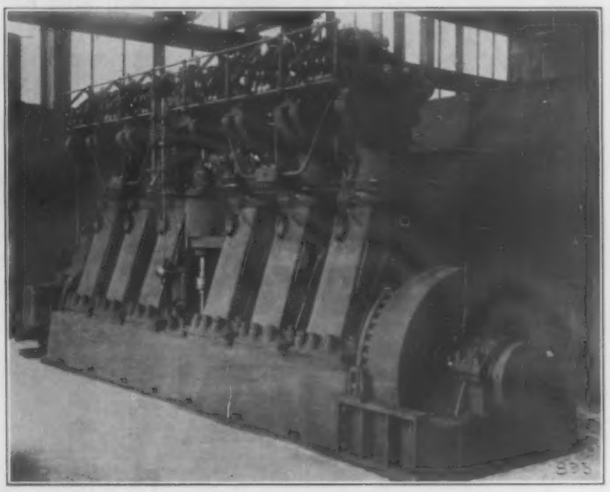
the engine room of the "Siam" to get acquainted with the new oil engine. Thus the shipping men of the Pacific Coast were introduced to the Diesel.

Every few months, and later every few weeks, a vessel propelled by the Diesel type oil engine visited our coast, and our interest was stimulated to a degree when we learned that the Diesel engine used in marine propulsion burned heavy oils directly in the cylinder by ignition through the temperature produced by the high compression of confined air, thereby effecting a fuel economy of approximately one to six over the steam driven vessel. We also heard that the motorships made their way from Denmark and Sweden to the Pacific Coast and thence to the Orient and back again without any trouble and in a perfectly satisfactory and efficient manner.

We soon decided that the European built Diesel driven vessels which visited our shores had passed the experimental stage and were a success, and would soon offer fair competition to our steam ships as cargo carriers.

The Evolution of the Semi-Diesel

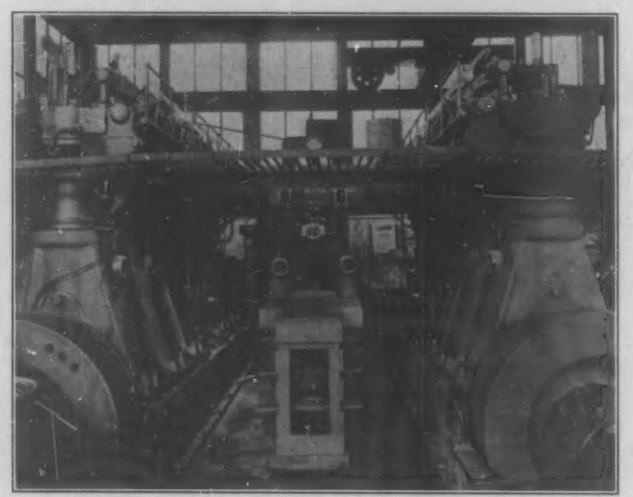
In 1916, when the demand for bottoms was so very urgent and every possible means was bent toward producing ships and equipping vessels to



Single unit Dow marine Diesel engine. The principle of the Diesel engine is quite distinct from the semi-Diesel, the chief similarity being in the use of fuel oil.

carry our products to Europe and to build still more ships to overcome the German submarine menace, the great problem of obtaining machinery presented itself. Ships had to be built quickly, with the materials available. Ships were desired which would operate economically, giving large cruising radius. Engine manufacturers were building steam engines and steam boilers for large steel ships and could give no time to the building of smaller engines for smaller ships or for commercial interest in general. The average ship owner was glad to get whatever he could.

The wooden sailing vessel was decided upon to meet the great emergency, and the so-called semi-Diesel type of engine was adopted as an auxiliary,



Engines of the "Libby Maine" on the test block. These are a pair of 425 i.h.p. Dow direct reversible heavy duty marine full Diesel type engines, connected when installed to Falk Reduction Gears through Nutall Flexible Couplings.

but subsequently used as a full powered propelling unit, as the case may have been. Thus a practice new to the shipping men of the Pacific Coast and untried by the manufacturers came into vogue. In the mad rush and excitement of the moment the semi-Diesel proposition associated ideas with the successful full Diesel practice of the Europeans. The term Diesel suggested economy and the use of our plentiful supply of heavy oil as a fuel, with the result that the semi-Diesel gained great popularity.

A Distinct Field

The Diesel engine practice is not that of the gas engine nor of the steam engine (although the Diesel indicator card is more nearly like a steam card than a gas engine card); it is positively and absolutely Diesel engine practice—a field in itself. American engineers acquaintd with the gas engine are too apt to consider the empirical formulae of the gas engine applicable also as empirical formulae in Diesel engine design.

In many cases engineers who were new at the Diesel game possessed the idea that they could make great improvements over the standard accepted European practice, chiefly in lightening parts, cheapening material and eliminating certain expensive processes in manufacturing. In Diesel engine design the European engineer is still our master and we must accept his practice until our experience warrants reasons for changes.

The lack of properly trained operating engineers has caused considerable trouble, although the Dow Pump and Diesel Engine Company has proven that any marine engineer who is young and who is willing to accept new ideas, or reason old ideas in a new light, as applied to a prime mover, will with very little difficulty and in a comparatively short time be made into a very efficient and successful operator of 4 cycle full Diesel engines.

The failure of one has affected the successes of others, for the good suffer as well as the bad in new fields of endeavor. For this reason, largely, the world has been prejudiced in the adoption of the internal combustion engine as a means of ship propulsion. Shipping men must recognize the distinction between the so-called semi-Diesel and the full Diesel principle and judge accordingly. The term semi-Diesel was invented for commercial reasons only, as in the hands of salesmen it linked up the idea of semi-Diesel to the full Diesel and caused the buyers of marine equipment and shipping interests in general to believe that the semi-Diesel was a modified or improved type of the Diesel principle, when as a matter of fact it approaches this principle in no way, except perhaps that heavy oil is used as a fuel.

The shipping world has had its experience with hot head engines and with auxiliary powered ships. A good many types of American built Diesel engines have been installed and tried out and have shown their weak and strong points. Marine engineers have had their opportunities to prove their skill in operating them. The time is fast approaching when the fair-minded ship owner can see that, after all, the American built combustion engine will win for itself a front rank position as a prime mover in ship propulsion.

A Pacific Coast Installation

An installation watched with unusual interest on the Pacific Coast is the motorship "Libby Maine." The "Libby Maine" is a 2000 ton wooden ship of very rugged heavy construction, built especially for severe Arctic service. She is 240 ft. long, 43 ft. beam, 24 ft. molded depth, and has a mean draft of 22 ft. 8 in. She is engined with a pair of 425 i.h.p. Dow direct reversible heavy duty marine full Diesel type oil engines, connected to Falk Reduction Gears through Nutall Flexible couplings. Each unit is tied to an engine bedding designed to give the maximum stiffness, and greatest security against deflection. Heavy timbering securely bolted to the ship's frames run in single lengths the entire length of the engine unit. The Nutall flexible coupling is placed between the main engine and reduction gear to relieve any possible strains between these units, as well as to act as a float. The reduction gear and thrust block are bolted to a single heavy cast iron sub-base. By the use of the reduction gear the most efficient engine speed of 250 r.p.m. and the most efficient propeller speed for this size of ship, 100 r.p.m., is obtained. The Nutall flexible coupling possesses the particular advantage that in case any or all of the driving springs are broken, the coupling

still serves its purpose in that the drive may operate through the then engaged spring lugs.

For the past six years the Dow Company has been building engines of this type, and has proven them to be a success and well adapted for burning our California crude oil of 16 and 17 gravity as a fuel. Two years ago the marine type of direct reversible engine was perfected, using all the highly developed and specialized features and construction of the original Willans & Robinson design. It is engines of this type with which the "Libby Maine" is equipped.

Details of Installation

The engines installed in the "Libby Maine" are of the 6 cylinder open "A" frame type of construction. Six cylinders were used in order to give maximum flexibility and positive starting positions, and the "A" frame design was adhered to because it afforded the greatest accessibility to the bearings and pins. Marine engineers are anxious to know where their pins and bearings stand and feel more secure when they are able to feel parts subject to heating.

The cylinders are separate cylindrical castings; cylinder leads are of standard box construction and pistons are of the long trunk type. The crankshaft is in two sections, the forward and after section being interchangeable. The lubricating system is controlled by drip oilers, the oil being measured into individual positively timed oil pumps attached to each "A" frame. One plunger of this pump supplies the piston lubrication and the other the piston pin. The main bearings are lubricated by ring oilers and the crank pin by centrifugal oil rings.

The operation of the entire engine is controlled by three levers centralized at one station. A novel feature of this installation is that one man is able to control both engines from one platform. Even in the treacherous waters of Bering Sea this control was absolutely responsive to the captain's wish.

Two levers are used to govern the action of the engine, while the reversing mechanism is manipulated by the third lever. Reversing is accomplished by the single movement of a vertical sliding cam, actuated by an oil compensated air piston, which automatically lifts the cam rollers clear of all cams, then slides the camshaft to the desired position and finally returns the cam rollers to the cams, thereby giving the proper timing of the valves for the new direction of rotation.

Air pressure is then applied to the pistons of the engine through the air starting valves by a single movement of the control lever until momentum is acquired, when another single movement of the same control lever automatically cuts off the air pressure and admits the fuel oil to the cylinders. The entire mechanism is thoroughly interlocked to guard against any false move on the part of the operator. Automatic locking devices block the execution of any movement not made in the proper sequence. The speed of reversal is controlled by the pressure of the air applied to the air piston of the reversing cylinder and the regulation of the velocity of oil displacement from one side of the piston to the other.

In order to obtain flexibility of operation, economic use of starting air, and added security against a shut down of the entire unit, two control levers are provided, one lever for each set of three cylinders.

The general characteristics of the engine are: i.h.p. 425, bore 12 in., stroke 18 in., crankshaft diameter 7½ in., speed 250 r.p.m., floor space 20 ft. by 5 ft. 1 in., height above center of crankshaft 8 ft. 10 in., approximate net weight 125,000 lbs.

Before installing in the ship the engines were completely erected in the shops and were thoroughly tried out. A 72 hour continuous test run was given each unit, during which the fuel economy averaged .412 lbs. per B.h.p. hr. or .308 lb. per i.h.p. hour.

Records in Practice

After installation at the Standifer Construction Company's yards at Vancouver, Washington, after only a few hours dock trial, the "Libby Maine" proceeded to Seattle and loaded her cargo for Bristol Bay. A non-stop record run was made to the entire satisfaction of Capt. Herre, the engineers, and the officers of the Libby Company. Some very difficult maneuvering was necessary in the dangerous Arctic waters, but the greatest ease of control was experienced at all times.

An ideal trip from Seattle to Honolulu and return to San Francisco was experienced and a record in fuel economy made. Extracts from the official log indicate the following:

Fuel oil consumption	259.5 barrels
Total distance	2440 miles
Time of voyage	14 days, 18 hrs., 15 min.
Average economy of 4.46 gal. per nautical mile	
Average speed	7 knots per hour

From San Francisco to Seattle very heavy weather was encountered. The chief engineer reported that the screw was out of the water half of the time, but no racing occurred at any time due to the perfect action of the governors.

Not at any time in 15,000 miles of travel had a tow line been drawn from her decks, but the law requires a tow in bringing a vessel up the Oakland Estuary, so here the "Libby Maine" suffered her first humiliation.

In all of the six years of Diesel engine experience of the Dow Pump and Diesel Engine Company not one single cylinder head, nor one single piston has proven defective or given the least trouble.

The engines of the "Libby Maine" are an example of approved European practice adapted to the needs of the Pacific Coast and stand as a milestone of progress in the use of the internal combustion engine as applied to marine propulsion.

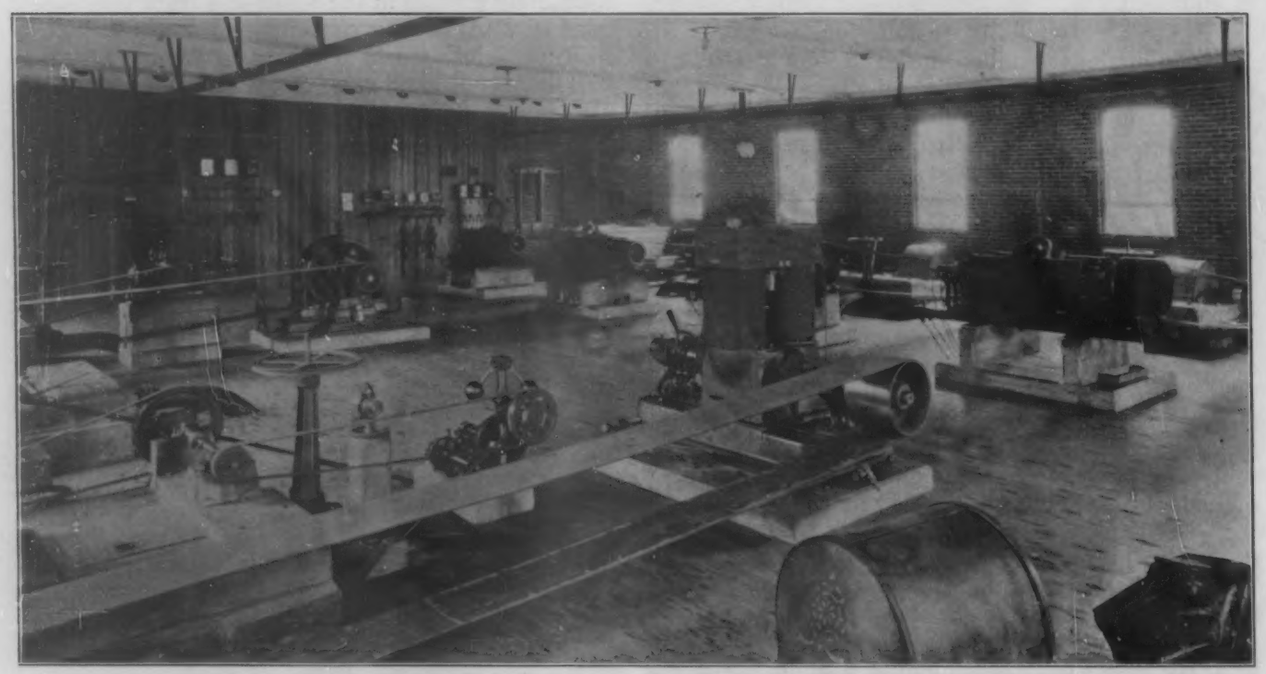
ELECTROCUTIONS AT LOW VOLTAGE

It is not necessary to connect yourself with a 50,000 volt line in order to be electrocuted. Experiments have proved that low-pressure electricity in sufficient quantity can be fatal by reason of certain effects upon the heart. One hundred milliamperes of alternating current at a pressure of 100 volts would kill a dog in a few seconds, while 400 to 500 milliamperes would be necessary in the case of direct current.

PRACTICAL LESSONS IN ELECTRICITY

BY H. H. BLISS

(Do you know the principles of operation of the electric apparatus with which you work? This course in the elements of practical electricity is particularly designed to meet the needs of those associated with the electrical business who wish to refresh their memories in the fundamentals. Supplementary material is offered by the Extension Departments of the Universities of California and Oregon. Any desiring to enter the course at this time will be furnished back copies.—The Editor.)



An early water power plant, built on Hunter Creek, Colorado, in 1888. Note the bipolar d.c. generator in the foreground, the multipolar machine at the left and the peculiar field arrangements of the generators near the brick wall.

ARMATURE AND FIELD WINDINGS

Of all the types of generators, the simplest is the alternating current magneto, which is used for ringing telephone bells and for ignition in gas engines. The magnetic flux is supplied by one or more stationary permanent magnets of horseshoe shape. The armature generally consists of a single coil wound upon an iron core, which revolves between the magnet poles. One end of the winding may be

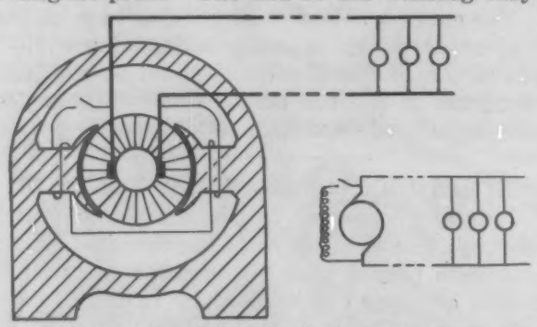


Fig. 1.—Shunt generator. Coils of small wire on the magnet poles are connected in multiple or shunt with the load.

"grounded" (connected to the metal of the armature) while the other is connected to the external circuit through a sliding contact.

All other generators have electro-magnets for producing the "magnetic field" or flux. The wires which carry the current around these magnets constitute the "field winding."

The magnets are "excited" by sending direct current through these windings, the current being produced either by the generator itself or by some external source. Direct current generators are almost always "self excited," while a.c. machines are "separately excited" by the use of small d.c. generators called "exciters." A few alternators have special arrangements for producing small amounts of direct current, thus saving the expense of an extra machine.

In Fig. 1 is shown the simplest arrangement for self excitation, a direct current machine with the field winding connected in multiple or "shunt" with the load. The diagram on the right is a preferable way to represent the same arrangement. Many turns of fine wire are used, which offer enough resistance to limit the field current to a small value, and yet give sufficient "ampere-turns" almost to saturate the iron with magnetism.

When the machine is stopped the current dies out of the shunt field and the magnetism disappears,

with the exception of a small amount which is known as "residual magnetism"; that is, the iron has to a slight extent the characteristics of a permanent magnet. When the generator is again brought up to its running speed, it is found that a low voltage is produced, and if the shunt field switch is then closed, a small current is sent through the coils. This increases the magnetism and raises the voltage, which comes up, little by little, to the pressure for which the machine is designed.

To control the electromotive force of a generator, it is customary to insert a variable resistance

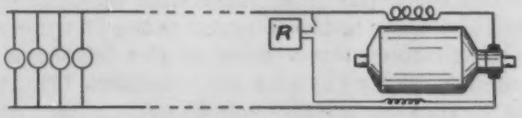


Fig. 2.—Compound wound generator. The load current passing through the series coils tends to raise the generated voltage as the load increases. The rheostat in the shunt circuit enables the operator to change the voltage at will.

or "rheostat" in the circuit of the winding. Thus the current and flux can be altered at will, and hence the voltage, which depends on the strength of the magnets, can be raised or lowered within wide limits. (See the rheostat, R, in Fig. 2.)

An additional feature of the field winding of most d.c. generators is shown in the "series winding" in Fig. 2. A few more turns of wire are put around the magnet poles and this wire (which is made of large size) is connected in series with the load. The additional magnetism thus produced raises the generated voltage as the current increases, and thus compensates for the increased "line drop" at heavy loads. A generator thus equipped is said to be "compound wound."

The field coils of an alternating generator are connected to the exciter through a rheostat. If the alternator field revolves, it is necessary to get the

Voltage regulation by the shunt rheostat is sometimes not sufficiently accurate. This series rheostat and ammeter are used to keep the current constantly equal to 20 amperes in the 600 watt gas filled lamp used in many moving picture projectors. What is the lowest possible generator voltage for this service?

current to and from the windings through sliding contacts on "slip rings." This is preferable to using sliding contacts for the generator current, which is usually at high voltage and of much greater volume than the exciting current.

Armature Winding.—Direct current generators usually have drum shaped armatures, built of many thin circular leaves or "laminations" of iron or steel. The wire is placed in slots cut lengthwise along the cylindrical surface and connected at numerous points to the copper commutator bars.

In Fig. 3 is shown a very simple winding for a "bipolar" (2 pole) machine having 6 slots in the armature, 12 inductors and 6 commutator bars. The letter B indicates the bar in contact with one of the brushes—let us say the "positive" brush, or the one at which the current leaves the armature. Then the current enters the winding at A, and flows along the wires to inductors numbered 1 and 7, both of which are under the influence of the N pole. Obviously, the machine must be turning in such a direction that voltage in wires under the N pole is directed into the paper, or away from the observer. Similarly, the inductors under the S pole must urge the current "out" or toward the observer.

This shows how the formed coils are placed on the armature and the terminals connected to the risers from the commutator bars.

Now we must imagine a wire across the back of the armature which carries the current from the far end of inductor No. 1 to the far end of No. 2. The pressure generated in No. 2 then assists that of No 1, and the current is forced along the wire shown, across the front end of the armature, to inductor No. 3, passing a commutator bar which is inactive because out of contact with either brush. The current flows "in" along No. 3, across the back of the armature to No. 4, across the front to No. 5, then across the back to No. 6, finally reaching bar B and leaving the armature. Six inductors in series have

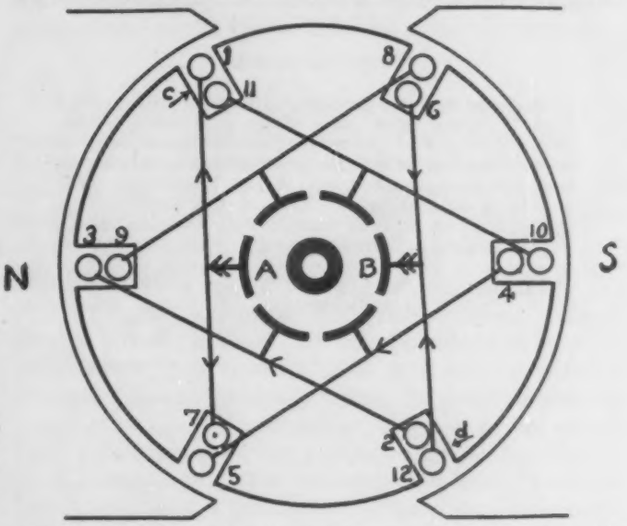


Fig. 3.—Armature of bipolar d.c. generator seen from end of shaft. Note connections of inductors (in the slots) to each other and to the commutator bars. Other interconnections at the other end of the armature are invisible in this view.

added their voltages, so that if the average pressure induced in each is .9 v., the machine generates 5.4 v.

The other inductors, commencing with No. 7, and working through Nos. 8, 9, 10, 11, and 12, perform a service exactly similar to that of the first set, producing a voltage of 5.4 in parallel or multiple with the first voltage considered. If the current is 5 amperes in each wire, the total current sent out of Bar B is 10 amperes. Thus we have the armature current twice that in one inductor, and armature voltage equal to the product of half the inductors times the average e.m.f. in one.

Generators with 4, 6 or more poles are not uncommon. The armatures may be so wound that there are only 2 parallel paths for the current or so that there are as many paths as poles, or with other numbers dependent upon variations in the methods of connection. With the "lap" or "multiple" winding there are at least as many paths as poles, and there must be as many brushes as poles. With "series" or "wave" winding there are, in general, only two parallel paths, and there may be either 2 brushes or as many brushes as poles.

There are often more than 2 inductors in one slot, especially in small machines. This necessitates cross connections on the front end of the armature in addition to those running to the commutator bars. Referring to Fig. 3, the wire might run "in" along the top of slot **c**, then across the back and "out" along the bottom of **d**, then across to slot **c** again (avoiding the commutator) and thus through **c** and **d** several times. The coil may be wound on a "form" and taped and varnished before being put upon the armature, and this is the usual practice for "multipolar" machines (having 4 or more poles).

The armature of Fig. 3 could be made to produce alternating current by taking away all the commutator bars except A and B and changing each of these to a "slip ring," so that it would be continuously in contact with the same brush.

RINGING DEVICE FOR TRANSMISSION LINE TELEPHONE

BY E. L. BLAINE

(Telephone systems used in conjunction with heavily loaded transmission lines often experience considerable difficulty in the ringing of the signal bell. A device which most satisfactorily remedies this condition has been worked out in the Northwest. The author is substation foreman, of the Spokane and Inland Empire Railway Company at Spokane, Wash. —The Editor.)

In order to facilitate ringing over a heavily loaded transmission line telephone system, the scheme as outlined below has been in use for several months by the S. & I. E. Railway over forty miles of line between Spokane, Washington, and Hayden Lake, Idaho, with entire success.

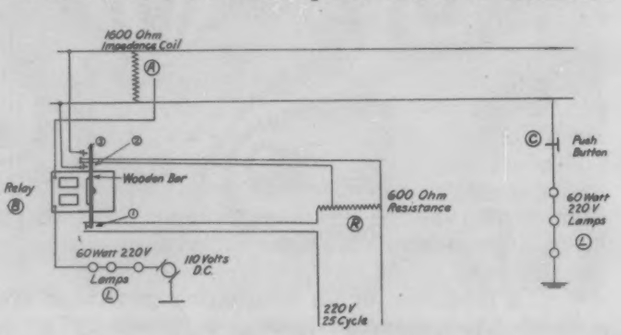
This telephone line is a complete metallic circuit of No. 10 hard drawn copper wire and equipped with 1600 ohm instruments and magneto generators, and is used for telephone communication only.

At the Spokane end of the line, twenty-five cycle energy is available for ringing purposes. For this, however, could be substituted a pole changer in case of a similar installation where proper ringing frequency is not otherwise obtainable.

The actual connections are as shown by the accompanying sketch. 1600 ohm impedance coil (A) is connected across the telephone line and connection is made from the middle point of this coil through a 1600 ohm relay (B), and lamp resistance (L), thence to one side of a 110 volt d.c. circuit, the other side of which is grounded. An outside wire of Edison three wire circuit using grounded neutral would meet this requirement.

The relay (B) is supplied with contacts which upon the closing of the relay, close the 25 cycle ringing circuit to the two sides of the telephone line through contacts (2) and (3). Contact (1) at the same time closes the 220 volt 25 cycle circuit across a 600 ohm resistance (R), to the opposite side of which is attached a wire to the contact (3). A wire to the contact (2) is attached at an intermediate point, to give a voltage suitable for best results in ringing.

Ringing is accomplished by means of a push button (C) placed at each point where ringing connection is desired. This push button is connected



CONNECTIONS FOR BELL RINGING DEVICE

Ringing is accomplished by ringing the push button at C which closes the 110v. d.c. circuit through the relay B and at the same time the ringing contacts, 1, 2 and 3.

from one side of the telephone line to the ground. Closing this button closes the 110 volt d.c. circuit through the relay (B) and closes ringing contacts (1), (2) and (3). Releasing this button opens the relay circuit and contacts (1), (2) and (3). Control of the relay operation and consequent ringing is thus in the hands of the person operating the push button.

Owing to the fact that this telephone line is carried on the same pole line as the 600 volt railway feeders, it was found necessary to place a resistance bank (L), consisting of three 60 watt 220 volt lamps connected in series, in the main relay circuit and in each push button circuit to protect against burning out of the telephone instruments in case of accidental contact between telephone and power circuits.

In cases where such protection is not necessary, a few cells of battery and a low resistance relay could be substituted for the 110 volt circuit and for the relay (B).

The relay (B) is a standard telegraph relay with 1600 ohm coils. The contacts (1), (2) and (3) are mounted on a light wooden cross bar and attached to the armature of the relay.

SPARKS—Current Facts, Figures and Fancy

(It may surprise you to learn that you ought to be in prison; that a professor of elocution invented the telephone and that a woodpecker recently held up a train; but do you realize that in view of the destructiveness of matches you ought to cook by electricity? We can stop fires, but as they can't stop rain in England, they take out insurance policies against it. These and other irrelevant items from all over the world are collected here for the delectation of the curious reader.—The Editor.)

"From office-boy to manager" is not a necessary recipe for success in any line. Bell, the inventor of the telephone, was a professor of elocution; Ingersoll the dollar-watch man was a stationer, and Eastman the kodak man was a bank clerk.

* * *

Movies on the ceiling are an innovation whereby the Red Cross is entertaining bed-ridden soldiers. By means of a special machine, the pictures are projected on to the ceiling where they may be enjoyed by patients who are not allowed to sit up.

* * *

The Department of Communications in Tokyo will install in each public automatic telephone a special electric clock. The clock is put in operation by the beginning of conversation, flashing a light so that the speaker can keep track of the cost of his loquacity.

* * *

A New York electrical and radio manufacturing concern will shortly install a complete radio telephone system between their factory and several branch stores, thereby relieving some of the congestion on the regular telephone lines connecting these units of the organization.

* * *

Because the long distance telephone between Tokyo and Osaka is in such demand that you have to wait several hours for your turn, the government is going to install a radio telephone operated over the ordinary wire telephone. The system will be open for public use in the near future.

* * *

During the war the A. E. F. Signal Corps operated 126,562 miles of lines, running through 14,854 telephone stations and 296 head central offices. At the time of the Armistice there were 1,000 officers and 27,000 other members of the Signal Corps on duty with the armies at the front.

* * *

The great majority of the inhabitants of the United States are liable to a $500 fine, six months imprisonment, or both. For the benefit of those who have escaped so far, we will explain that these penalties are provided in the Federal penal code for persons who issue checks, notes and so forth for a sum of less than one dollar.

* * *

A railway tunnel under the Straits of Gibraltar is now being advocated. This, together with the proposed tunnel under the English Cannel and the recently completed one under the Pyrenees from Aix to Puigcerda, would seem to indicate that something has given the public a taste for subterranean travel; air raids, perhaps.

* * *

The illumination of air ports is a subject which was discussed at the recent Pan-American Aeronautical Congress. The plan under consideration involved the lighting of the ground in such a way as to bring out the essential features—runways, wires, buildings and boundaries—so that a flier landing by night could clearly see the field and its available landing space.

* * *

During the year 1918 there were 899 fires in Ontario caused by the careless use of matches, with total losses amounting to $234,525. Our informant says matches should be kept out of the way of children, but as no self-respecting child ever yet permited himself to be outwitted by his parents in things of that kind, we suggest electricity as the only practicable solution of the difficulty.

* * *

Rain is now classed with burglaries, fire and accidents by British insurance companies, and vacation-seekers may take out policies against it. This opens up a fertile field of possibilities: Why not institute sun-insurance for California farmers during the rainy season, and even insure orchards against caterpillars, birds, small boys and other accidents?

* * *

A hold-up by a woodpecker is the latest in railway records. Attracted by the relay apparatus of a signal box—whether for nutritive or building purposes is not related—the bird pecked at the wires until they short-circuited. At once the signal blade swung up, denoting danger, and the engine-driver of the next train waited patiently for a whole hour before he suspected that the signal was not authoritative, and investigated.

* * *

The electrical section of the Disposal Board is going to place on the market certain articles which until now have been confined to military and naval circles. One is a daylight signaling lamp, another an electric mine exploder. The first might conceivably be utilized by civilians, but somehow the idea of the second as a parlor toy, for instance, does not appeal to us.

PERSONALS

H. L. Garbutt, for the last six years manager of the Line Material Section of the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., who has recently been appointed manager of the Supply Division of the Westinghouse San Francisco office, is already well known on this coast through his effective work in experimentation with insulator design and transmission line problems. In 1908 Mr. Garbutt became a part of the sales organization of the Drew Electric & Manufacturing Company of Indianapolis, handling various types of overhead line material. He remained with the company until 1909, when he entered the Supply Department of the Chicago office of the Westinghouse Company, as line material specialist. He served in this position until 1913, when he was made manager of the Line Material Section, with offices at East Pittsburgh, Pa., remaining there until his recent promotion.

H. H. Jones, manager of the San Diego Consolidated Gas and Electric Company, is a recent San Francisco visitor.

C. K. G. Billings, the New York electric light and gas magnate, has been staying in San Francisco with a large party.

Elgin Stoddard, manager for Charles C. Moore & Company, San Francisco, was a recent visitor at the Seattle office of the company.

C. O. Yoakum of Portland, Ore., district sales manager of the United States Shipping Board, is among recent visitors to San Francisco.

H. D. Howell, district manager of the Westinghouse Lamp Company, Denver, has just returned from an extended trip through the east.

R. M. Martin, of the Benjamin Electric Company, has returned to Seattle after visiting Salt Lake City and the Inter-Mountain country.

R. M. Cole, of the Seattle office of the Economy Fuse Manufacturing Company, is making a trip through eastern Washington, Idaho and Montana.

J. F. NePage of NePage, McKenny Company, electrical engineers and contractors, Seattle, has been visiting the San Francisco office of the company.

Roy Worth of the Pacific States Electric Company, Seattle, has returned to Seattle after two weeks spent at the Shriners' convention in Indianapolis.

C. C. Hillis, formerly president of the Electrical Credit Association, has returned from the East where he has been attending the meeting of the association.

D. D. Faris, manager of the marine department of the Westinghouse Electric & Manufacturing Company, is among the recent prominent visitors to San Francisco.

D. H. Foote, head of the Pacific Gas and Electric Company, Hayward, was one of San Francisco's recent visitors. Mr. Foote was accompanied on his visit by Mrs. Foote.

Lieutenant-Colonel Henry M. Byllesby, president of H. M. Byllesby & Company, who served as Purchasing Agent for Great Britain and Scandinavian countries for the American Expeditionary Forces, with headquarters in London, has just been advised that the English Distinguished Service Order has been conferred upon him.

C. E. Grunsky, well-known civil engineer of San Francisco, has returned home from Minneapolis where he has been attending the convention of the American Society of Civil Engineers.

S. G. Jackson, formerly in the electrical contracting business in Berkeley, has returned to California after a year's absence in France and is looking about with a view to new connections.

William Locke, for many years sales manager with the Hazard Manufacturing Company, has joined the forces of Bittmann & Battee, Inc., of San Francisco, and will handle the Hazard line.

Ross L. Mahan, formerly Captain in the Engineer Corps, has returned to San Francisco from France and is now carrying on his work as sales engineer with the Pelton Water Wheel Company.

Willis M. Deming, president and general manager of the Technical Publishing Company, has been at Santa Cruz attending the convention of the California Association of Electrical Contractors and Dealers.

Charles Grunsky, who served in France as Captain of Engineers, has resigned from the army and has returned to the Pacific Coast, where he has resumed his former position under the California Railroad Commission.

J. N. Chamberlin, who for several months has been acting division plant engineer with the Pacific Telephone & Telegraph Company, has been appointed division plant engineer, Central Division, to succeed C. E. Fleager.

J. C. Merriam, Professor of Paleontology, University of California, returns from leave of absence and is named department chairman for the ensuing year. He has been acting as chairman of the National Research Council in Washington, D. C.

J. L. Isaac has recently become associated with the Service Department of the Westinghouse Electric & Manufacturing Company and is successfully bringing before the large users of motors the efficient repair service offered by this department.

F. B. Tough, petroleum technologist of the U. S. Bureau of Mines, with headquarters at the San Francisco office, left San Francisco June 2 to take charge of cooperative work being carried on by the Bureau with the Midwest Refining Company and the Ohio Oil Company in the Wyoming oil fields.

Prof. Leon J. Richardson, who is perhaps best known to electrical men of the Pacific Coast through his recent efficient work at the head of the Military Bureau of the University of California, has been appointed head of the University of California Extension Division. Owing to the broad policy of practical service which has been the aim of our great state universities in this field, there are few Westerners who have not in some measure benefited through university extension work. Many of the readers of the Journal of Electricity are now taking advantage of the course in practical electricity in which this journal is cooperating with the extension divisions of the Universities of California and Oregon. Prof. Richardson's effective service in bringing together government needs and civilian and military workers through the Military Bureau augurs well for his present work, and the electrical industry is fortunate in the outlook for even wider cooperation from the University under Prof. Richardson's leadership.

Leonard F. Fuller, who has been doing important work with high voltage phenomena in the laboratories of the Federal Telegraph Company at Palo Alto, has severed his connection with that company to accept the position of assistant manager of the Ohio Insulator Company at Barberton, Ohio. The remarkably interesting work accomplished at this laboratory, in which Dr. Fuller had so important a part, has attracted much attention recently from those interested in the handling of high voltages. A recent meeting of the San Francisco Section A. I. E. E. was held in Palo Alto for the purpose of inspecting this installation, and proved one of the most instructive of the season's gatherings. Stanford University at its commencement a few days past, conferred upon Dr. Fuller the degree of Ph.D. in electrical engineering in recognition of his service along these lines.

Howard H. Douglas, connected with the Reclamation Service, formerly stationed at Minidoka, has been transferred to Rupert, Ida.

A. J. Myers, Pacific Coast manager, Wagner Electric Manufacturing Company, was in Los Angeles recently looking after the growing business of his company in that section.

Robert Sibley, editor of the Journal of Electricity, has returned from Detroit, Michigan, where he has been attending the convention of the American Society of Mechanical Engineers, as representative of the Pacific Coast Sections.

Frank I. DuFrane has resigned after fifteen years' service as Telephone Sales Specialist with the Western Electric Company at San Francisco, to become associated with the Sierra Electric Construction Company, manufacturers' agents at San Francisco.

C. S. Coler, for some years Director of Trades Training with the Westinghouse Electric & Manufacturing Company, has been appointed manager of the company's Educational Department to succeed C. R. Dooley, who goes to join the Standard Oil Company.

F. D. Barrett, formerly commercial manager of the Mountain States Power Company, is now a member of the flourishing Acorn organization of Rathbone, Sard & Company. He is assigned to the Western territory and is handling the company's electric line in the Northwest.

J. F. Kinder has been appointed by the Apex Electric Specialty Company, of St. Louis, as their sales representative at Portland, Ore., for the northern coast district. Mr. Kinder being thoroughly acquainted with the trade in that territory, is particularly well fitted for his position.

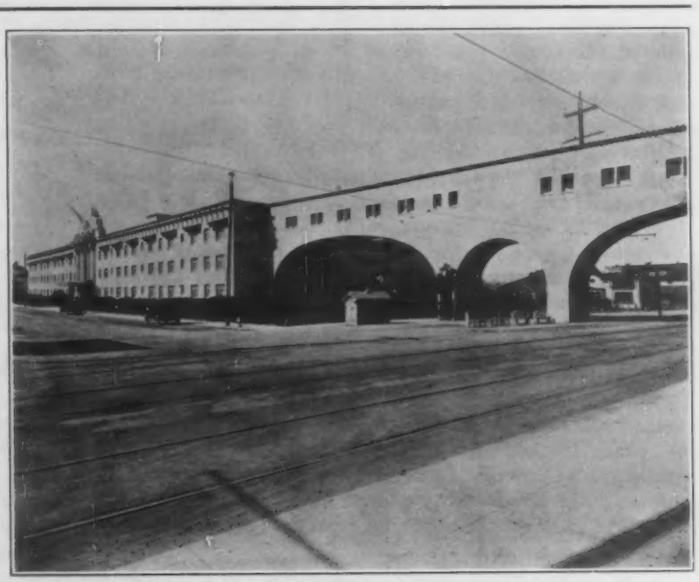
Theodore J. Hoover, well known to the scientific world as an international mining expert and also as the brother of Herbert C. Hoover, has been named as head of the mining and metallurgy department at Stanford University. Mr. Hoover will assume his duties in October of this year.

Edward De Nike, formerly chief clerk at Dinuba with the San Joaquin Light & Power Corporation, has been transferred to the accounting department on the company's construction project near Auberry. He is succeeded at Dinuba by H. G. Jobe who has recently returned from France.

Theodore N. Vail, president of the American Telephone & Telegraph Company, has resigned the presidency of the company and assumed the newly-created position of chairman of the company's board, in which capacity he will devote his attention to the larger problems of policy and development. He is succeeded as president by H. B. Thayer, who has been with the company for forty years.

L. J. Corbett, formerly professor of electrical engineering at the University of Idaho and consulting engineer, and for the past year a Captain of Engineers on duty at Washington, D. C., has returned to the Pacific Coast as a special agent of the Federal Board for Vocational Education, San Francisco office, and is engaged in the work of rehabilitation of disabled soldiers and sailors.

Major Charles E. Sholes is the newly elected vice-president, director and general sales manager of the Edison Storage Battery Company, succeeding Harrison G. Thompson who has resigned to organize and conduct the Transportation Engineering Corporation of New York. Major Sholes is particularly well known to the chemical industry, and during the war served as Chief of the Chemical Branch in the Ordnance Department, and as Army Representative before the War Industries Board.



The Casa Del Rey at Santa Cruz, where the Contractor-Dealers of California have just been holding their convention. The convention program was one of singular interest and was interspersed with a number of most enjoyable outdoor social events, for which the location was especially adapted.

Meeting Notices for Electrical Men

(An important gathering in connection with the California Electrical Cooperative Campaign, and the annual meeting of the National Electrical Credit Association are among interesting recent events in electrical circles. The Contractor-Dealers have been active in many sections and the recent Santa Cruz convention has acted as a great stimulus to this branch of the industry.—The Editor.)

California Cooperative Campaign

One of the livest meetings ever held by the electrical men of Southern California was staged by the Executive Committee of the California Electrical Cooperative Campaign in Los Angeles recently. Only manufacturers, jobbers, and their salesmen were invited, the purpose being to form a salesman's auxiliary to assist in the work of the California Cooperative Campaign.

The meeting was preceded by a banquet, the arrangements for which were taken care of by A. L. Spring, local Field Representative of the California Cooperative Campaign.

After the banquet Glen Arbogast called the meeting to order, concisely outlined the purpose of the meeting, and announced that D. C. Pence of the Illinois Electric Company had been appointed chairman of the Southern California section of the Salesman's Auxiliary of the California Electrical Cooperative Campaign.

Mr. Pence called immediately on L. M. Harper, manager of the Western Electric Company, who gave a very enthusiastic talk on the work of the Campaign, and who brought out the point that too much time had been given to the manufacturing and engineering end of the game, and not enough to the distribution. He emphasized the fact that the salesmen should encourage dealers to tie-in with the national advertising of the manufacturers by advertising locally and derive the benefit of this great expenditure on the part of the manufacturers for advertising. Mr. Harper said that if the dealer did not wake up to this situation, department stores, who are already realizing the vast amount of business obtainable through tying-in with the manufacturers' national advertising, would take this business completely out of their hands. He heartily endorsed the plan of organizing the Salesman's Auxiliary.

Mr. Pence next called on Dave E. Harris, sales manager of the Pacific States Electric Company, San Francisco, who endorsed the plan and stated that the time had come when the whole electrical industry was united to push along the good work of the California Electrical Cooperative Campaign. He said that they intended to form a similar Salesman's Auxiliary in San Francisco and hoped that the movement would spread through the country. Every one was very much interested in Mr. Harris' remarks in regard to securing an executive to direct the campaign from San Francisco, and all looked for big results from this end.

K. E. Van Kuran, district manager of the Westinghouse Electric & Manufacturing Company, was called on next and gave a splendid address on the accounting system. He urged all salesmen to study enough accounting to help their dealer install this new system gotten out by the National Association of Contractor-Dealers. Mr. Van Kuran brought out most forcibly that the success of the Campaign rested in putting the dealer on a firm financial basis, and called the salesmen's attention to the flexibility of the system.

A. W. Childs, of the Southern California Edison Company, a member of the Advisory Committee, urged the dealers to put on solicitors in proportion as central stations decreased their sales efforts. There are sixty salesmen successfully working in California under the supervision of the California Cooperative Campaign, and in closing Mr. Childs urged the salesmen to encourage the dealers to take advantage of these solicitors.

A. L. Spring, Field Representative of the California Electrical Cooperative Campaign, brought out in a clear and forceful manner the work of the campaign in the past year. Mr. Spring stated that perhaps the biggest work that had been done was the securing of closer cooperation between the central stations, manufacturers, jobbers and dealers, and also in helping the contractor-dealer to occupy the proper place in the electrical industry. Mr. Spring stated that when he first went into the smaller towns of Southern California he frequently found that the dealer and the central station representative did not even know each other. He arranged to have the men meet each other at lunch and in this way secured much closer cooperation. A great deal has also been done to eliminate any antagonistic feeling between the dealers. Mr. Spring said he was exceptionally gratified to see the stand of the central stations in encouraging the dealers to sell appliances. He also stated that in the past year 19 dealers had moved into new quarters, 16 had completely remodeled their stores and many other stores had been rearranged. He was very enthusiastic over the outlook and stated that with the help of the Salesman's Auxiliary he felt confident the Campaign would take big strides.

Mr. Pence explained how the territory of Southern California had been divided into sections, and a vice-chairman of the Salesman's Auxiliary put in charge of each district, with two salesmen under him to help in promoting the work of the Campaign. All other salesmen were expected to help, but definite work to be carried out would be assigned to members of the committee.

The committeemen will be changed from time to time, so that the work will be equally distributed.

BUILDERS OF THE WEST—LVI.

STANLY A. EASTON

The inspiration of the West with its boundless possibilities and the vastness of the scale of its operations has called for the initiative in Western engineers to step beyond the bounds of tradition and establish new records in every line of endeavor. Among the world records thus established in the West is that of the electrification of the Bunker Hill and Sullivan mine at Kellogg, Idaho—the greatest lead silver mine in the world and the one operated most completely by electricity. To Stanly A. Easton, the efficient general manager of the mine, to whom is due an enduring share of the credit for this feat, this issue of the Journal of Electricity is affectionately dedicated.

Electrical Contractors and Dealers, Salt Lake City

As one of the results of the recent electrical gathering in Salt Lake City the electrical men of the city have organized the "Electrical Contractors and Dealers' Association of Salt Lake City." The officers are as follows: President, G. W. Forsberg; vice-president, J. V. Buckle; secretary, E. H. Eardley; treasurer, L. G. Robbins.

Oregon Association of Electrical Contractors and Dealers

The regular meeting of the Oregon Association of Electrical Contractors and Dealers for District No. 1 was held on June 2. The Wiring Committee reported on its plans for the house-wiring campaign, and the question of establishing an approximate standard price for installing electric ranges was referred to the Wiring Committee.

J. R. Tomlinson was elected a member of the local Executive Committee to fill the vacancy left by the resignation of R. W. Larsen.

Vancouver Association of Electrical Contractors and Dealers

One of the results of the recent Contractor-Dealer Convention at Vancouver (an account of which appeared in our last issue) is to be the organizing of all the electrical men in British Columbia into an Electrical Club which, it is hoped, will run in association with a projected Electrical Engineers' Association and with the Vancouver Association of Electrical Contractors and Dealers.

A. I. E. E. Annual Convention

The Thirty-fifth Annual Convention of the American Institute of Electrical Engineers was held June 24-27 at the Lake Placid Club, Essex county, New York. Following the annual Presidential Address, by President C. A. Adams, came the introduction of President-elect Calvert Townley, the remainder of the session being devoted to the presentation of papers under the auspices of the Protective Devices Committee.

On the second morning the annual reports of the technical committees were presented and discussed; on the third there was an open conference under the auspices of the Committee on Development, and the last morning was given over to a Technical Session, under the auspices of the Transmission and Distribution Committee, at which a number of interesting papers were presented.

National Electrical Credit Association

The twentieth annual meeting of the National Electrical Credit Association was held at Hotel Gibson, Cincinnati, June 13th and 14th. The meeting convened at ten o'clock. President Charles C. Hillis, Electric Appliance Company, San Francisco, welcomed the delegates who came mostly from the eastern, southern and central states. He was followed by a brief report from each of the members on the National Board of Managers representing the Electrical Credit Associations of Boston, New York, Philadelphia, Chicago and San Francisco, the activities of which cover the entire country.

The General Secretary's summary showed a total membership of 577 of the representative electrical manufacturers and jobbers.

The total number of names of slow or otherwise unsatisfactory customers reported to the five associations was 167,758. Both in number and in amount involved there was a decrease on an average of 30% as compared with the preceding year, and of more than 50% as compared with the totals of 1915. It was conceded that the activities of the five local associations of Boston, New York, Chicago, Philadelphia and San Francisco, composing the national body, had served in such timely fashion for the members generally as to guide them against extending credit to irresponsible or unsatisfactory customers and thus save them from preventable losses. The showing, therefore, was regarded as a splendid evidence of the effectiveness of the service of the Electrical Credit Association.

In recognition of increased expenses the national board voted to increase the per capita dues levied by the National Association upon the five local associations, effective November 1, 1919, to insure a safe margin in the financial budget upon which to conduct the service.

It was provided further that the names of municipalities defaulting in the payment of their indebtedness, warrants, etc., to members, should appear in a special department of the National Monthly Bulletin for the credit guidance and protection of the membership at large.

The most important single report presented was that by George J. Murphy, Pettingell-Andrews Company, Boston, chairman of the Committee on Standard Accounting System for Contractors and Dealers in the electrical industry. The work of Mr. Murphy and his committee received the unanimous and hearty endorsement of all members present and it was urged that each should study the 12-page pamphlet issued by the National Association of Contractors and Dealers, 110 W. 40th St., New York City, embodying the work of the committee, and that the system be adopted by the contractor and dealer customers of the manufacturers and jobbers composing the National Electrical Credit Association.

Particularly notable was the address of W. C. Culkins, Director of Street Railways of Cincinnati, who took as his subject Public Utilities and showed the absolute necessity for a better understanding of the problems of public utilities by the citizens at large.

Among the subjects of general interest treated by the members attending was the address of T. K. Quinn, of the National Lamp Works at Cleveland, on Consignment Credits and Lamp Agents. The value of the National Monthly Bulletin and the systematic use of forms by William R. Conklin of the Waclark Wire Company of Elizabeth, N. Y. V. G. Fullman of the Steel City Electric Company, Pittsburgh, spoke informally on credit interchange luncheon clubs. The other subjects presented in the advance notice of the meeting were ably handled by the speakers assigned.

The following officers were elected: President, Benj. P. George, Beardslee Chand. Mfg. Co., Chicago; vice-president, Geo. J. Murphy, Pettingell-Andrews Co., Boston; general secretary-treasurer, Frederic P. Vose, Chicago; assistant secretary-treasurer, Walter S. Vose.

San Francisco Electrical Development League

At a meeting of the San Francisco Electrical Development League held on June 16th the Reverend Josiah Sibley, pastor of Calvary Presbyterian Church, gave a most forceful and interesting talk on Cooperation and its relation to the unified church movement. C. E. Wiggin, who was chairman of the day, spoke on the position of the jobber in the electrical industry.

A. I. E. E., Portland Section

The new officers of the local section of the A. I. E. E., Portland, Ore., are as follows: W. D. Scott, chairman; E. H. Le Tourneau, secretary; R. M. Boykin, W. C. Heston and E. W. Moreland, executive committee.

N. E. L. A., Portland Section

At a recent meeting of the local section of the N. E. L. A., Portland, Ore., the following officers were elected: F. H. Murphy, chairman; C. L. Wernicke, vice-chairman; Geo. Bowen, secretary; R. J. Davidson, treasurer; E. D. Searing, E. F. Whitney, and W. M. Wood, executive committee.

Pacific Service Employees Association Dinner

The third annual dinner of the Pacific Service Employees' Association of the Pacific Gas & Electric Company was held in San Francisco on June 19th, with a large and enthusiastic attendance. F. R. George, chairman of the Asso-

ciation, presided as toastmaster. John A. Britton urged upon his auditors the necessity for loyalty and the steadfast adherence to the principles under which the American government was founded, and for cooperation in the continued support of right principles.

Mr. Britton introduced Hon. Henry A. Melvin, Associate Justice of the California Supreme Court, who gave an address on "The Layman's False Notion of Cross Examination."

In connection with the entertainment features an elaborate program was staged under the direction of R. E. Fisher, as chairman of the Program Committee.

Illuminating Engineering Society

The 1919 Convention of the Illuminating Engineering Society will be held at the Hotel Sherman, Chicago, Ill., on October 20th to 23rd, inclusive.

The chairman of the 1919 Convention Committee is Homer E. Niesz; vice-chairman, Wm. A. Durgin, and secretary, Edwin D. Tillson.

Colorado Electric Light, Power and Railway Association

The following officers have been elected by the Electric Light, Power and Railway Association of Colorado: President, E. A. Phinney, Jefferson Power and Light Company, Golden, Colo.; vice-president, Norman Read, Colorado Power Company, Denver; secretary and treasurer, F. P. Safford, Denver Gas & Light Company, Denver. Meetings will be held on special occasions and the Association will hold its annual convention at Glenwood Springs in September.

Santa Cruz Convention of Electrical Contractors and Dealers

The electrical men convening at Santa Cruz on June 27 and 28 enjoyed a large number of social events in addition to the very interesting program outlined in our last issue. Golfing, swimming, boating and dancing were available to the guests, and those able to stay over at the close of the convention had an opportunity to witness the swimming meet scheduled for June 28 and 29.

A. I. E. E. Western Members

The following were among those elected to Associate membership in the American Institute of Electrical Engineers at the meeting held on May 16, 1919:

Harold Butler Barnes, Electrical Engineer, of H. B. Barnes and F. S. Youtsey, Denver, Colo.; John Emil Beckman, Chief Operator, Bryant St. Substation, U. R. R. of San Francisco, San Francisco, Cal.; Wallace Brier, Batteryman, Puget Sound Traction, Light & Power Co., Seattle, Wash.; Orange Reece Cole, Division Supt. of Construction, Pacific Telephone & Telegraph Company, San Francisco, Cal.; Charles Mortimer Day, Chief Draftsman, Electric Division, U. S. Reclamation Service, Denver, Colo.; Edward F. Dunlap, Salesman, Economy Fuse & Manufacturing Company of Chicago, Portland, Ore.; Ernest Hattrick, Asst. Elec. Engr., Mountain States Telephone & Telegraph Company, Denver, Colo.; John Edward Heller, Engineer on Transmission Work, Pacific Telephone & Telegraph Company, San Francisco, Cal.; Joseph C. Henkle, Supt. Service Dept., Portland Railway, Light & Power Company, Portland, Ore.; Noel Bertram Hinson, Distribution Dept., Southern California Edison Company, Los Angeles, Cal.; Roy Lester Houck, Testing Dept., Portland Railway, Light & Power Company, Portland, Ore.; Homer G. Keesling, Asst. to Supt. of Elec. Distribution, Pacific Gas & Electric Company, Oakland, Cal.; Robert William Koch, Manager Electrical Dept., The Flint Electric & Manufacturing Company, Denver, Colo.; Franck Laine, Sales Engineer, Westinghouse Electric & Manufacturing Company, San Francisco, Santa Clara, Cal.; Donald R. McClung, Designing Draftsman, Pacific Power & Light Company, Portland, Ore.; Frank Nosworthy, Switchboard Engineer, Pacific Telephone & Telegraph Company, San Francisco, Cal.; Wilber H. Robinson, Electrician, Sunset Motor Company, Spokane, Wash.; Benedict Shubart, Manufacturers' Agent, Denver, Colo.; Conrad J. Steinel, Supt. of Telegraph, L. A. & S. L. R. R., Los Angeles, Cal.

WESTERN MEETINGS

June 11—Jovian Electric League, Los Angeles—Prof. Kio Sue Inui—"Japan's Policies in the East and How They Affect American Interests."

June 19—A. S. M. E., Los Angeles Section—Lieut. Harold E. Weeks—"The Balloon and Aerial Photography in Its Relation to Warfare."

June 23—San Francisco Electrical Development League—D. C. D. Miel.

June 27—Engineers' Club of San Francisco—Major F. T. Robson—"Over There."

WHERE THE MEN OF THE INDUSTRY MEET

(The place where you can find where and when the other man meets. Information as to changes in officers, or additions or corrections, should be addressed to the Service Editor, Journal of Electricity. It is hoped to keep this directory up to date, so that travelers in a strange town who wish to attend the meetings of allied groups may not be misdirected.—The Editor.)

A. I. E. E.—WESTERN SECTIONS

National Officers
President—Calvert Townley, Westinghouse Electric & Manufacturing Company.
Secretary—F. L. Hutchinson, Engineering Society Bldg., New York City.
Meetings—Monthly.

Los Angeles Section
Chairman—J. H. Cunningham, General Electric Co., Los Angeles.
Secretary—Clem A. Copeland, Bureau of Power and Light, Los Angeles.
Meetings—Second Tuesday of each month.

Portland Section
Chairman—W. D. Scott, Pacific Telephone & Telegraph Company, Portland, Ore.
Secretary—E. H. Le Tourneau, Portland Railway, Light & Power Company, Portland, Ore.
Meetings—Monthly.

Denver Section
Chairman—Fred J. Rankin, Colorado Pub. Utilities Com., Denver.
Secretary—Robt. B. Bonney, 603 Wyoming Bldg., Denver, Colo.
Meetings—Third Saturday of each month, from October to May, at the Denver Athletic Club. Dinner at 6:15 p.m., followed by regular meeting.

San Francisco Section
Chairman—J. C. Clark, Stanford University, Cal.
Secretary—Allen G. Jones, Rialto Bldg., San Francisco.
Meetings—Fourth Friday each month—Engineers' Club, 7 p.m.

Seattle Section
Chairman—John Harisberger, 4015—4th Ave. N. E., Seattle, Wash.
Secretary—T. C. Smith, City Lighting Department, Seattle, Wash.
Meetings—Monthly on third Tuesday in Chamber of Commerce Assembly Room, 9th floor, Arctic Bldg.

Spokane Section
Chairman—George Nixon, Main and Lincoln Sts., Spokane.
Secretary—G. H. Hoppin, 1128 W. Kiernan Ave., Spokane.
Meetings—Third Friday of each month.

Utah Section
Chairman—A. S. Peters, Mountain States Telephone & Telegraph Co., Salt Lake City, Utah.
Secretary—H. T. Plumb, 183 U St., Salt Lake City, Utah.
Meetings—Third Wednesday of alternate months, 8 o'clock. Assembly Room of Commercial Club, Salt Lake City.

Vancouver Section
Chairman—R. F. Hayward, Western Canada Power Co., Ltd., Vancouver, B. C.
Secretary—T. H. Crosby, Canadian Westinghouse Co., Vancouver, B. C.

A. I. E. E.—WESTERN BRANCHES

University of California Branch
Chairman—A. E. McMahon, University of California, Berkeley, Cal.
Secretary—D. D. Davis, University of California, Berkeley, Cal.

University of Colorado Branch
Meetings—First and third Thursdays of each month of the school year in the Engineering Building, University Campus.

Idaho University Branch
Meetings—First Wednesday evening of each month from October to June.

Oregon Agricultural College Branch
Chairman—Lawrence Fudge, Oregon Agr. College, Corvallis, Ore.
Secretary—Otto L. Cantrall, Oregon Agr. College, Corvallis, Ore.

Stanford University Branch

Montana State College Branch
Secretary—J. A. Thaler, Montana State College, Bozeman, Mont.
Meetings—Third Friday of every month of the school year in the Electrical Bldg.

Throop College of Technology Branch
Chairman—Mark Sawyer, Throop Dormitory, Pasadena, Cal.
Secretary—Russell Otis, Throop Dormitory, Pasadena, Cal.

State College of Washington Branch
Chairman—Clarence E. Guse, Pullman.
Secretary—Ralph C. Guse, State College of Washington, Pullman.
Meetings—Bimonthly at Mechanics Art Bldg., Pullman, Wash.

CONTRACTOR-DEALER ASSOCIATIONS

National Association of Electrical Contractors and Dealers
Chairman—W. Creighton Peet.
Secretary—W. H. Morton, 110 West 40th St., New York.
Executive Committeemen, Pacific Division—J. R. Tomlinson, Portland, J. F. NePage, Seattle, Wash.

Electrical Contractors & Dealers of Salt Lake City
President—G. W. Forsberg.
Secretary—E. H. Eardley, Eardley Bros., Salt Lake City.

British Columbia Ass'n Electrical Contractors and Dealers
President—E. Brettell, Vancouver, B. C.
Secretary—Capt. W. J. Conway, Vancouver, B. C.
Meetings—First Tuesday of each month.

California Ass'n of Electrical Contractors and Dealers
President—M. A. De Lew, 180 Jessie St., San Francisco.
Secretary—J. W. Redpath, Rialto Bldg., San Francisco.
Meetings—Monthly.

Electrical Contractors and Dealers Ass'n of San Francisco
President—C. L. Chamblin, 641 Mission St., San Francisco.
Secretary—J. Stewart, San Francisco.
Meetings—Saturday 12:30; The States.

Southern California Electrical Contractors and Dealers
President—G. E. Arbogast, 724 So. Olive St., Los Angeles, Cal.
Secretary—J. E. Wilson, 425 Consolidated Realty Bldg., Los Angeles, Cal.
Meetings—Every Friday at 6:30 p.m. at the Pin Ton Cafe, 427 South Broadway.

Monterey Bay Electrical Contractors and Dealers
President—W. Cox, Santa Cruz.
Secretary—D. K. Noggle, Monterey.

Nevada Ass'n of Electrical Contractors and Dealers
President—F. V. McAvoy, 138 N. Canter St., Reno.
Secretary—R. W. Shearer, 215 Sierra St., Reno.
Meetings—Twice a month, 15th and 30th.

Oregon State Ass'n of Electrical Contractors and Dealers
President—R. C. Kenney, 388 Burnside street, Portland.
Secretary—J. Willis Oberender, 209-10 McKay Bldg., Portland, Ore.

Portland Local Ass'n of Electrical Contractors and Dealers
President—Roy C. Kenney, Portland.
Secretary—J. W. Oberender, 209-10 McKay Bldg., Portland.
Meetings—Alternate Mondays at Imperial Hotel Grill.

Sacramento Section, California Electrical Contractors & Dealers' Association
President—W. H. Gribble, Sacramento.
Secretary—H. Berg, Sacramento.

Washington Ass'n of Electrical Contractors and Dealers
President—V. S. McKenny, NePage & McKenny Co., Armour Bldg., Seattle, Wash.
Secretary—Forrest E. Smith, Seattle, Wash.
Meetings—Quarterly—second Thursdays of March, June, September and December.

JOBBERS' ASSOCIATIONS

Electrical Supply Jobbers Association
General Secretary—Franklin Overbagh, 411 So. Clinton St., Chicago, Ill.
Meetings—Semi-annual.

Pacific Coast Electrical Supply Jobbers
President—W. S. Berry, Western Electric Company, San Francisco.
Secretary—Albert H. Elliot, 544 Market St., San Francisco.
Meetings—Quarterly.

Electrical Credit Ass'n of the Pacific Coast
President—C. L. Gilson, Gilson Electrical Supply Co., 304—12th St., Oakland, Cal.
Secretary—Albert H. Elliot, 544 Market St., San Francisco.
Meetings—annually; San Francisco; May.

OF ELECTRICAL INTEREST

California Electrical Cooperative Campaign
Chairman Advisory Committee—L. H. Newbert, 445 Sutter St., San Francisco.
Secretary—R. M. Alvord, Rialto Bldg., San Francisco.

National Electric Light Association
President—R. H. Ballard, Southern California Edison Company.
Secretary—A. H. Halloran, Journal of Electricity.

Nevada Section, N. E. L. A.
Chairman—Geo. A. Campbell, Reno, Nev.

Pacific Coast Section, N. E. L. A.
President—A. E. Wishon, San Joaquin Light & Power Corporation, Fresno, Cal.
Secretary—A. H. Halloran, Journal of Electricity, Electric Bldg., San Francisco.
Meetings—Annually, in April.

Portland Section, N. E. L. A.
Chairman—F. H. Murphy. Portland Railway, Light & Power Company.
Secretary—Geo. Bowen, Portland, Ore.

Illuminating Engineering Society
President—George A. Hoadley.
Secretary—Clarence L. Law.
Western Representatives—Romaine Myers, Bacon Bldg., Oakland, Cal.; C. M. Masson, Edison Bldg., Los Angeles; F. H. Murphy, Portland Railway Light & Power Company, Portland, Ore.; W. R. Putnam, Utah Power & Light Company, Salt Lake City; Fred A. Osborn, University of Washington, Seattle, Wash.
Meetings—First Tuesday each month.

New Mexico Electrical Association
President—D. W. Morgan, Las Cruces, N. M.
Secretary—Charles Twogood, Albuquerque, N.M.
Meetings—Annually, in February.

Southwestern Electrical and Gas Association
President—W. A. Sullivan, Shreveport, La.
Secretary—H. S. Cooper, 403 Slaughter Bldg., Dallas, Texas.

Northwest Electric Light and Power Ass'n
President—H. J. Gille, Puget Sound Traction Light & Power Co.
Secretary—W. E. Herring, Puget Sound Traction, Light & Power Co.
Meetings—Convention held annually. Executive Committee, governing body of Association, meets upon call of its chairman.

Los Angeles Jovian Electrical League
President—A. E. Pent, San Joaquin Light & Power Corp.
Secretary—Frank Weiss, Los Angeles Gas & Electric Corp.
Meetings—Every Wednesday, 12 m.

San Francisco Electrical Development League
President—Garnett Young, 612 Howard St., San Francisco.
Secretary—J. W. Redpath, Rialto Bldg., San Francisco.
Meetings—Every Monday, 12:10 p.m.; luncheon, Palace Hotel.

Electric Metermen's Association
President—J. E. Bridges, Westinghouse Electric & Manufacturing Company.
Secretary—A. E. Coney, Great Western Power Company, San Francisco.
Meetings—About every 60 days.

Alameda County Electrical Club
President—George Drew, Pacific States Electric Company, Oakland, Cal.
Secretary—George B. Furniss, Pacific Gas & Electric Company, Oakland, Cal.

Synchronous Club
Secretary—H. N. Beecher, City Hall, Los Angeles.

Telephone and Telegraph Society of the Pacific Coast—San Francisco Section
President—W. H. Brommage, Pacific Tel. & Tel. Co., San Francisco.
Secretary—Chas. H. Dobson, 835 Howard St., San Francisco.

MECHANICAL ENGINEERS

National Officers
President—Mortimer E. Cooley, Electrical Engineering Dept., AnnArbor, Mich.
Secretary—Calvin W. Rice, Engineering Society Bldg., New York City.

San Francisco Section, A. S. M. E.
President—E. C. Jones, Pacific Gas & Electric Co., San Francisco.
Secretary—Geo. L. Hurst, Bethlehem Ship Bldg. Corp., Ltd., San Francisco.
Meetings—Quarterly.
Thursday lunches have been arranged at the Engineers' Club, 57 Post St.

Los Angeles Section, A. S. M. E.
President—Charles H. McGuire.
Secretary—T. J. Royer.
Meetings—Quarterly.

ENGINEERS' CLUBS

Oregon Society of Engineers
President—John W. Cunningham, 414 Spalding Bldg., Portland.
Secretary—Orrin E. Stanley, Box 973, Portland.
Meetings—Annual: First Monday in February. Monthly: Third Thursday of each month. Third Thursday of each month.

The Engineers' Club of Seattle
President—H. E. Horrocks, Seattle, Wash.
Secretary—E. J. Bartells, Northern Life Bldg., Seattle, Wash.
Meetings—Thursday noon at the club rooms at 410 Arctic Bldg. A buffet luncheon is served every day. A special welcome is extended to all engineers visiting the city.

Engineers' Club of San Francisco
President—A. E. Chandler, New Call Bldg., San Francisco.
Secretary—J. R. Brownell, 525 Market St., San Francisco.
Annual Meeting: October.

Idaho Society of Engineers
President—W. H. Gibson, Mountain Home, Idaho.
Secretary—Ira F. Shaffner, Boise, Idaho.

Engineers' Club of Oakland
President—R. S. Chew, Oakland Chamber of Commerce, Oakland.

Engineers' Club of Sacramento
President—George S. Nickerson, 914 Forum Bldg., Sacramento.
Secretary—P. M. Noeboe, State Department of Engineering, Forum Bldg., Sacramento.

United Engineering Societies of San Francisco
Chairman—C. D. Marx, Stanford University.
Secretary—Nathan Bowers, Rialto Bldg., San Francisco.

Joint Committee Technical Societies of Los Angeles
Chairman—George A. Damon.
Secretary—W. K. Barnard, 705-6 Central Bldg., Los Angeles.

Utah Society of Engineers
President—Leonard Cahoon.
Secretary—Wm. H. Kelsey.
Meetings—3rd Wednesdays except May, June, July and August.
Annual banquet—May.

MISCELLANEOUS

American Ass'n for the Advancement of Science—Pacific Division
President—D. T. MacDougal, Director Desert Laboratory, Carnegie Institution, Tucson, Arizona.
Secretary (acting)—J. R. Douglas, 430 Library, University of California, Berkeley, Cal.
Meetings—Annual.

Portland Section A. S. C. E.
President—P. H. Dater, Eng. U. S. Forestry Service.
Secretary—C. P. Keyser, Park Bureau, Portland, Oregon.
Meetings—At call of president.

Spokane Engineering & Technical Ass'n
President—L. K. Armstrong, A. S. M. E.
Secretary—A. D. Butler, City Engineer, Spokane, Wash.
Meetings—Third Friday of each month. Joint with A. S. C. E., A. I. E. E. and A. S. M. E.

Foreign Trade Club
President—W. H. Hammer, Monadnock Bldg.
Secretary—Wm. E. Hague, Monadnock Bldg.
Meetings—238 Merchants Exchange Bldg., San Francisco. Every Wednesday evening.

Pacific Coast Gas Association
President—John D. Kuster, care Pacific Gas & Electric Co., San Jose, Cal.
Secretary—Henry Bostwick, 445 Sutter St., San Francisco.

Society for Promotion of Engineering Education
Secretary—F. L. Bishop, University of Pittsburgh, Pittsburgh, Pa.

Los Angeles Transportation Association
President—C. G. Krueger, 324 S. Broadway, Los Angeles.
Secretary—D. W. Ferguson, 324 S. Broadway, Los Angeles.

HAPPENINGS IN THE INDUSTRY

LOS ANGELES PURCHASES DISTRIBUTING SYSTEM OF THE SOUTHERN CALIFORNIA EDISON COMPANY

A heavy vote was registered at Los Angeles, California, on the proposed issue of $13,500,000 bonds by the city for the purchase of the electric distributing system of the Southern California Edison Company. The proposal was carried by 1300 votes more than the necessary two-thirds majority. The question of authorizing the sale of surplus aqueduct power to the Edison Company was also carried, receiving 300 votes over the necessary two-thirds of the total vote cast.

The purchase price is divided between $1,000,000 including the physical valuation and $2,453,067 severance damages for taking the business of the company. For thirty years the city is to purchase from the company power required in addition to that generated in its own plants, the price to be fixed by the State Railroad Commission.

The Edison Company retains all of its business outside the city and also the traction load within the city.

THE HETCH-HETCHY CASE

In testifying for San Francisco in the city's suit to condemn the lands of the Yosemite Power Company in the Poopenaut Valley, City Engineer O'Shaughnessy stated that the three dams of the original project, Hetch-Hetchy, Lake Eleanor and Cherry Creek, will be insufficient, and that five more dams will be necessary to meet the city's future need of water. The Poopenaut Valley is desired for one of these.

From the testimony of Engineer J. D. Galloway it appeared that the city also needed the Poopenaut Valley dam site for a regulating reservoir to serve the contemplated power projects associated with the water-supply development, and the question of adequately financing the scheme by means of further bond authorization is demanding the city's serious attention.

NATIONAL ELECTRICAL CODE CORRECTION

In the printing of the 1918 edition of the National Electrical Code the second paragraph of Rule 23, section A-2 was accidentally omitted. In the 1915 edition of the Code the paragraph read as follows:

"Where the switch required by No. 24 'a' is inside the building, the cutout required by this section must be placed so as to protect it, unless the switch is of the knife blade type and is enclosed in an approved box or cabinet, under which conditions the switch may be placed between the source of the supply and the cutout."

The Electrical Committee of the National Fire Protection Association has voted that this matter be given the publicity necessary to inform interested parties of the omission.

ELECTRIFICATION OF RAILWAYS IN JAPAN

The Imperial Government Railways have decided to electrify part of the steam road. The sections already decided upon are as follows: Yokohama to Numazu, 67.4 miles; Ofuna to Yokosuka, 10 miles; Uyeno to Ohmiya, 16.6 miles; Ryogoku to Chiba, 22.7 miles, making a total of 116.7 miles. The only difficulty confronting the authorities is the lack of suitable sources of electricity. It is said that engineers will be sent to nine provinces surrounding Tokyo in quest of promising water power sites.

When the project under consideration is realized, practically all the roads entering Tokyo will be electrified, and will be of considerable service in increasing the transit capacity as well as in clearing the city of the smoke and dust attendant on steam locomotives.

THE ELECTRICAL INDUSTRY IN CHINA

During 1916 and 1917 the value of electrical materials imported into China increased from $39,273 to $66,563. As articles imported for government use are duty free and not listed, these figures do not include the customs returns on materials purchased for the government-operated electric light and telephone departments. In 1916 the electricity department of Tsingtau expended $44,699 for materials, and $55,700 in 1917.

NEW PLANT IN WYOMING

At Green River, Wyoming, the new plant of the Liberty Potash Company of Salt Lake City is nearing completion. The electrical equipment consists of 2—500 kw. Allis-Chalmers generators driven by Parsons steam turbines, which supply the power for electric drive throughout the plant. The steam boiler equipment consists of 4—250 h.p. Babcock & Wilcox Stirling boilers, provided with chain-grate automatic stokers. From the ash-pits a tramway will carry the ashes to the elevator which is to dump them into waiting cars.

RAILROAD COMMISSION HEARING

Departing from its customary course, the Railroad Commission held a "Safety Valve" hearing recently at the close of the more formal presentation of points for and against discontinuing the war surcharge in the electricity rate. Grievances of individuals and corporations were presented and aired.

The Natomas Consolidated, represented by Charles W. Slack, protested that the war surcharge cost of electric power is a hard burden for the gold dredgers, since the value of the gold has grown less in purchasing power, while all the costs of operation have increased. He said that the production of gold is encouraged by the Federal Government and should not be discouraged by state-made rates for electric power. The other companies engaged in dredging for gold had the same complaint, and some of them said the voltage had gone down while the rates had gone up.

UNITED STATES CIVIL SERVICE EXAMINATIONS

The United States Civil Service Commission announces open competitive examinations for the positions of Radio Inspector and Radio Subinspector, for both men and women.

The duties of the first position will be to supervise the installation of radio apparatus on ship and ashore under the supervision of the radio officer; to calibrate and adjust radio transmitters and receivers; to make service measurements, such as capacities of antennae, damping of spark transmitters, etc.; and to make routine inspections of radio apparatus installed on ship or shore stations. Appointees must be qualified to handle men doing installation work under their guidance.

The duties of appointees to the position of Subinspector will be to assist in installing radio apparatus on ship or shore stations, make simple calibrations and adjustments of radio apparatus, and make routine inspections of radio apparatus when installed.

Other examinations announced are for the positions of Radio Laboratorian and Laboratorian Aid, Expert Radio Aid, and Electrical Assistant. These are listed for men only.

JAPANESE NOTES

It is reported that Tokyo is to have a subway to help solve its transportation problem, but in order to render im-

mediate relief to the traffic conditions, the mayor of Tokyo has recommended to the city council the purchase of 200 street cars.

To meet the increased demand for electric light bulbs, a Japanese bulb manufacturing concern is arranging for the installation of a large number of additional machines during the present year.

ALAMEDA CLOSES ITS POWER PLANT

The municipal electric lighting plant at Alameda, Cal., which for some months has been supplying but a small portion of the power used in the city, is today idle, following a decision recently made to use entirely current purchased from power companies.

The high cost of fuel at present and the fact that an existing contract with a power concern provides the city with current at a figure permitting resale at a profit, has brought about the determination to close the plant at least for the present.

SALE OF NORTHERN CALIFORNIA POWER COMPANY

Directors of the Northern California Power Company met recently at the office of the company and unanimously approved the action of President W. F. Detert in making a tentative agreement for the sale of the properties of the company to the Pacific Gas & Electric Company at $34 a share. Notices have been sent out to the stockholders fixing a date for final deposit of stock with the Mercantile Trust Company and carrying full details of the reasons why it is advisable to sell the properties. These details have already been published. It is understood that a sufficient number of stockholders have assented to the sale and agreed to make the deposit of their stock when notified to do so.

WATER POWER DEVELOPMENT IN NEW SOUTH WALES

In the State of New South Wales there is under consideration a scheme of hydroelectric development of the Nymboida River. It is estimated that the cost would be about $175,000, and would comprise in part alterations to tunnel inlet works on the river, the installation of two 800-kilowatt generators, a transmission line of 23 miles, and a distribution system in the towns of Grafton and South Grafton. It is the purpose to furnish power to farmers along the way for small engines as well as to the towns of Grafton and South Grafton.

TRADE NOTES

New Business —

The Electric Furnace Construction Company, Finance Building, Philadelphia, reports the following orders received for Greaves-Etchells Electric Furnaces: Lancia Company, Turin; Bresciana Company, Brusche.

They have also successfully started up new furnaces at the Daimler Motor Company, Coventry; at the Tyne Electric Steel Foundries, Ltd.; and also a furnace for Kayser-Ellison & Company, Ltd., Sheffield, designed for up to 15 tons cold metal or 20 tons hot metal process.

New Offices

The Central Steel Company, Massilon, Ohio, has opened up new offices in Detroit, in the Book Building, 35-37 Washington Boulevard. Mr. Arthur Schaeffer, former assistant director of sales at the home office, Massilon, has been appointed district manager of sales, with Frank Gibbons as his assistant.

Business Plans —

The Northern Auto Electric Company, a co-partnership recently formed by Fred C. Guenthre and Wm. G. Grabau, both of Oakland, California, has been awarded the King and Pierce counties, Washington, agency for the Exide storage batteries and have completed negotiations for a long time lease on the southeast corner of Summit avenue and East Pike street, Seattle, and a 90 by 60 ft. one-story frame building is to be erected for their use. A specially built generator set has been purchased by the company and is to be installed as soon as delivered. Other modern equipment will also be installed.

Partnership Resumed —

E. C. Miller, for the past two years engineer for the Kilbourne & Clark Manufacturing Company, Seattle, makers of wireless apparatus, has resumed his partnership with his father G. M. Miller, in the hydraulic and general engineering field. The firm name will be G. M. Miller & Son with offices in the Burke Building, Seattle. The concern has just completed a valuation of the Edmonds, Washington, water system, controlled by the Yost estate of Edmonds, which is offering to sell it to the city.

Bond Issue —

Henry L. Doherty & Company, Syndicate Managers, announce they are forming a syndicate to underwrite an issue of $25,000,000 Bond Secured Sinking Fund Convertible 6% Notes of the Empire Gas & Fuel Company, the principal oil producing subsidiary of the Cities Service Company.

Distributors Appointed —

The National Tube Company of Pittsburgh, Pa., have made arrangements with the National Metal Molding Company, of Pittsburgh, and the American Circular Loom Company, of New York, to act as their distributors of Spellerized Mild Steel Tubing, made especially for the manufacture of rigid steel conduits. These two companies will, as heretofore, finish and market this tubing under the following trade names: National Metal Milding Company, "Sherarduct" and "Economy"; American Circular Loom Company, "Xduct" and "Electroduct."

Expansion of Service —

The Central California Electric Company, Inc., of Lindsay, Cal., has added four automobile electric service stations in connection with their regular contracting business. These are located at Lindsay, Exeter, Visalia and Tulare.

Western Distributors —

Simplex Electric Heating Company of Cambridge, Mass., have made arrangements with M. Seller & Company of Portland, Ore., with branches at Tacoma, Seattle and Spokane, to act as distributors for the states of Oregon and Washington of their new spherical type glowing radiator and also their ranges, flat irons and heating pads.

Patent Suit —

The Majestic Electric Development Company has issued the following statement:

"On June 16, 1919, a jury in the District Court of the United States for the Northern District of California, in San Francisco, rendered verdicts in our favor in two cases sustaining the validity of our design patent, No. 51,043, issued July 17, 1917. One of these suits was against Holabird Electric Company and the other one was against Hale Brothers, Inc., R. H. Henderson and Hotpoint Electric Heating Company, and they involved the two forms of the so-called "Hedlite Heater" heretofore put out by the Hotpoint Company, both of said forms being held by the jury to be infringements upon our said design patent."

Business Announcement —

The Garden Electric Manufacturing Company of Emeryville, Cal., announces that it is specializing on the manufacture of transformers, and will shortly issue a leaflet describing a variety of its products, ranging from small air cooled low voltage transformers to large high tension transformers. formers.

New Headquarters —

The Anaconda Copper Mining Company has moved its main selling headquarters for the Rolling Mills Department from Great Falls, Montana, to 1102 Westminster Building, Chicago, Ill. The object of the move is to have the office more centrally located.

INFLUENCE OF FORESTS ON WATER SUPPLY

A Letter to the Editor

(The article to which this writer takes exception appeared in the March 15th issue of the Journal of Electricity. We are always glad to print letters from our readers and we welcome all discussion of material appearing in our columns.—The Editor)

Editor, Journal of Electricity:

The writer wishes to enter a protest against the acceptance of the conclusions reached in the article by Alfred A. Griffin under the above title, appearing in the issue of March 15, 1919, of the Journal of Electricity.

The conclusions quoted from that article are:—

"The retardation of this amount of snow is sufficient to be of great importance to irrigation interests, especially as it is generally understood that a forest cover tends to 'flatten out' the crest of a flood, and thus to increase the minimum flow at periods of low water. A forest cover thus supplements the possible artificial reservoirs."

The writer has been a close student of the irrigation and power developments in the Pacific Northwest for the past 14 years. During five years of that time he was in charge of the water supply investigation for that district for the U. S. Government. He believes he knows whereof he speaks.

The Tumalo and Yakima rivers drain the eastern slopes of the Cascades. There is much more irrigable land contiguous to both streams than the available water supply will irrigate. The waters of both streams are stored in reservoirs for irrigation purposes.

It is of vital importance, therefore, that there be as much run-off as possible from these areas, while the question of a few days delay in the melting of a small portion of the snowfall is so far down the scale of importance that it is of no concern whatever to the irrigator.

Now, what are the facts as evidenced by Mr. Griffin's figures?

1. The Yakima watershed would have had 15 inches more of snow in April, 1917, without forests than it did with them. This is equivalent to 225 acre-feet per square mile of drainage area.

2. The delayed melting caused by the forest cover was the equivalent of 360 acre-feet per square mile delayed for eleven days from June 11 to 22, long before the irrigation demand reached its climax in July and August.

3. The Tumalo watershed would have had 10 inches more of snow on April 5, 1915, without the forests. This is equivalent to 210 acre-feet per square mile.

4. The delayed melting in 1916 was the equivalent of 465 acre-feet per square mile for 15 days. Dates are not given, but doubtless prior to July 1 and certainly prior to the time of maximum irrigation demand.

5. On the Tumalo watershed in 1917 the delayed melting was the equivalent of 277 acre-feet for a period of not exceeding 4 days and long prior to the maximum irrigation demand. The total loss in water supply is not given.

6. The waters of Wind River are not, nor are they ever likely to be, used for irrigation. In 1916 the delayed melting was the equivalent of 720 acre-feet per square mile for 17 days. In 1917 it was equipalent to 160 acre-feet for 8 or 9 days. The total losses are not given.

The reason for the loss of water in forested areas is obvious. The trees themselves catch a large portion of every snowfall and hold it until evaporated. This portion never reaches the ground and of course is not available as streamflow.

In the open all the snowfall reaches the ground, which accounts for the greater depths at the open stations as noted by Mr. Griffin.

These areas were selected and the stations established thereon with a view to determining "with some definiteness the effect, if any, of forests in representative portions of the Cascade Range on the melting of winter snow cover * *." It is to be assumed therefore that the stations were at a sufficient elevation to fairly represent the average time of melting as influenced by altitude. An additional fact of importance is that the year 1916 was one of abundant water-supply during which there was no shortage of irrigation water. On the other hand, 1917 was a very low water year and acute shortages of irrigation water were felt throughout all irrigated portions of the Northwest.

The actual effect of the forests on the Cascade Range, as evidenced by Mr. Griffin's presentation of the data, appears to have been:

1. To deprive the irrigator in a year of acute shortage of 200 or more acre-feet per square mile of drainage area that would othewise have been reservoired and used for the production of crops.

2. To delay the melting of about an equal amount of snow for a week at the beginning of the irrigation reason, and at a time when there is a large surplus of water in the streams; an effect utterly valueless to the irrigator.

The writer asks in all seriousness, do these effects tally with Mr. Griffin's conclusions that they are of "great importance to irrigation interests * * * and increase the minimum flow at periods of low water"?

The other statement, that "it is generally understood that a forest cover tends to 'flatten out' the crest of flood" is equally at variance with the facts.

The theory that forests on the watershed of a stream act as a substantial conserver of precipitation has been accepted by many people as an established fact. The theory has been so oft repeated and urged upon us so persistently that those who have given the subject only casual thought accept it without further question.

The fact is, however, that this theory has never been established, nor is it admitted by many scientists and engineers whose disinterested opinions on the subject we are forced to respect.

The writer has lately received an illustrated pamphlet entitled "What the National Forests Mean to the Water User," by Samuel Dana, Assistant Chief, Forest Investigations, published and distributed at government expense, in which the same sort of utterly unjustified conclusions are drawn from improperly digested data and examples.

There appears to be a determined effort to spread broadcast a propaganda that the forests have great economic and beneficial effects upon the water supply of the country. The reason for this is obviously to justify certain so-called conservation charges for water supplies originating within the national forests, and furthermore to enhance government control of national industries as affected by water power development.

The writer is a firm believer in and an ardent supporter of the principles of governmental control of national forests and other resources. He knows of no irrigation or power companies who object to paying their fair share of the cost of administration of the forest resources. He is passionately fond of the forested mountains with their cool shades and thundering rivers, and wonderingly adores the marvelous beauties in nature's gardens of the Northwest.

His sense of fairness, however, will not permit him to pass unprotested this spurious doctrine that, for purely sordid purposes, makes jest of our intelligence and gives the lie to nature.

J. C. STEVENS.

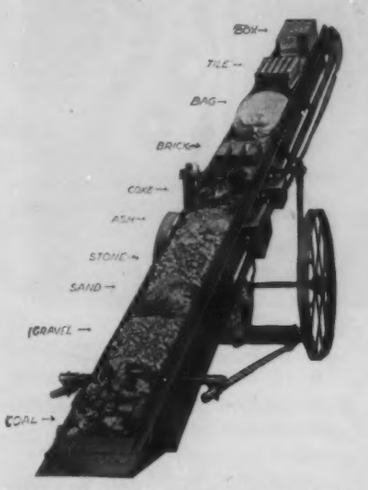
The Journal of Electricity is glad to give space to expression of views by its readers on subjects of interest appearing in its columns. These should be brief and impersonal in tone—but the presentation of either side of the controversy is welcomed. Address all communications, "Editor, Journal of Electricity, 171 Second Street, San Francisco."

LATEST IN EVERYTHING ELECTRICAL

(Portable equipment of light weight is always in demand, and the Scoop Conveyor and Electric Drill described and illustrated here aim to meet the need. An interesting meter-installation by a gas company, a handy lamp, a new type of rotor, and a well-constructed punch are among other recent developments in industrial devices.—The Editor.)

A NEW TYPE OF CONVEYOR

A new type of Portable Conveyor, which cuts the labor of loading one-half, is shown in the accompanying illustrations. The most distinctive feature of this machine, called the Scoop Conveyor, is the scoop on the feeding end, which can be pushed or completely buried into the material to be conveyed. This makes it possible to simply scrape the material on to the carrying belt, instead of lifting it up by shovelfuls into the feeding hoppers of ordinary conveyors.



A 19 ft. 8 in. Scoop Conveyor equipped with 16 in. wide belt and driven by a 2 h.p. electric motor.

Another exclusive feature of this machine is the construction of the sides or skirt plates as they are called. These form a trough which enables a 12 in. wide belt to equal in carrying capacity a 20 in. ordinary troughed belt, the side plates holding the material together and giving the whole width of the belt carrying effectiveness.

The carrying capacity of the conveyor, based on handling coal, is one ton per minute, provided a sufficient amount of coal is maintained at the receiving end of the machine. It is used principally for storing, reclaiming and loading bulk material and light articles, but serves a number of other purposes such as elevating material to tanks or platforms in chemical and industrial works, feeding from cars and delivering into fixed conveyors or stoker magazines at power plants, etc. Almost any kind of material can be handled, and the conveyor may be used singly, in tandem or in triplicate as may be required.

It is strongly constructed, light, compact and portable. It is manufactured by the Portable Machinery Company of Passaic, N. J., and obtainable in three different sizes.

A SMALL LAMP

An electrical novelty to be marketed under the trade name Baby Light has been developed by the St. Louis Brass Manufacturing Company, St. Louis, Mo. It consists of an all-porcelain lamp, white glazed with a transformer device to reduce the voltage of an ordinary light circuit to six volts for a very small lamp. It is said that the current consumed with this device is so small that it will not turn the average house meter and that the cost of operation in view of the small current consumption is so slight as to be insignificant.

The Baby Light will no doubt be favored for use in nurseries, sick rooms, halls, bed rooms and wherever a night lamp is desirable. It is complete with 6 feet of cord, plug, lamp, switch, etc., ready for use by screwing the plug to any lamp socket.

THOMAS METERS FOR GAS COMPANY

The Citizens Gas Company of Indianapolis has just completed the installation of two Thomas meters in their Langsdale Avenue plant. The equipment and piping arrangement is interesting because it permits the use of either of the two meters to measure the gas load while the other is held in reserve; or the two meters may be thrown in series, each measuring the same gas and checking the other's accuracy. When peak loads occur or when unusually heavy demands make larger capacity necessary, the two meters may be operated in parallel. The accompanying illustrations show the two meter housings and the instrument panels which contain the totalizing graphic meters. The meters measure the coke over gas obtained from one battery of 43 Semet Solvay ovens. The housings and panels are located in a part of the office building, which was formerly occupied by a 16 foot drum station meter. The housings are each 16 inches in diameter and are inserted in a 24-inch line between the purifiers and the storage holder. Each meter is of 200,000 cubic feet per

Unloading from a coal car to the storage pile with a Portable Scoop Conveyor. The conveyor may be used singly, in tandem or in triplicate according to the height and location of the car, pile or platform.

hour capacity, which is sufficient to handle the coke oven gas load. The pressure drop through the entire installation is less than ½ inch of water with 200,000 cubic feet of gas per hour. A platform built around the housing facilitates inspection of the parts of the meters which are contained within the housings.

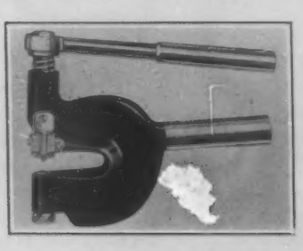
The providing of duplicate measuring and recording apparatus, although not generally practiced by gas plant management, is gaining favor with the appreciation of the value of accurate measurement of gas in large quantities. Especially is this true where the graphic records thus obtained have been an aid to more efficient operation.

Thomas Meters in the Langsdale Ave. plant of the Citizens Gas Co., Indianapolis. To the right below are the instrument panels located in the same room.

A NEW TOOL

The accompanying illustration shows a new type of speed punch, put on the market by Paul W. Koch & Company. This tool, known as the "Jiffy" Punch, is 9½ inches long, weighs five pounds, and punches 5/32 in., 3/16 in., 7/32 in. and ¼ in. holes in metal up to 10 gauge.

Special features are the deep throat and one-piece automatic disappearing stripper, giving clear view to the punch



This tool can be clamped in a vise or carried to any place desired. It weighs five pounds.

and next punch mark. It permits of several sheets being punched with one operation. The handle above the center keeps the punch naturally upright. If desired the tool may be clamped in a vise.

A PORTABLE ELECTRIC DRILL

A portable electric drilling machine has recently been advantageously employed in countersinking ship plates at a number of fabricating shops engaged in work for the Emergency Fleet Corporation. A wall radial drill has usually been used for this purpose, but the portable electric drilling

This machine will countersink a hole up to one inch in diameter, and is readily moved on the buggy from one hole to another.

machine attached to a buggy designed for the purpose has resulted in greater speed and a reduction of labor cost.

The Van Dorn Electric Tool Company, of Cleveland, has recently designed a portable drilling machine, very powerful and of heavy, rigid construction. The machine is fastened into the buggy by two studs, these studs being screwed to trunnion bosses on the housing and fastened to the handles of the buggy. The buggy is counterweighted in front, leverage being provided by pressure applied to the handles. The plates being laid out on the shop floor, it requires only an instant to move the machine from one hole to another.

The machine is ball-bearing throughout. The top head and gear housing are bolted to the motor casing, eliminating tapped holes and worn-out threads. A double row of ball-bearings withstand both thrust and radial load.

The machine measures 22 inches and weighs 125 lbs. It is equipped with No. 4 Morse taper socket and will countersink a hole up to one inch in diameter. It is claimed that the buggy enables this machine to countersink a ⅞-inch hole in 7 seconds.

A NEW TYPE OF ROTOR

A new type of rotor with cast winding which has been recently designed by the General Electric Company, Schenectady, N. Y., presents new features and improvements worthy of brief description.

The bars and short-circuiting rings comprising the windings employ the same material and are cast in a single operation. With the windings thus made a solid unit, rigidity, durability, and better balance is procured. The cast winding from an electrical point of view also insures uniform cross section and union between the bars and the end rings. This has become a factor in eliminating operating difficulties due to open-circuiting of joints between bars and end rings.

Holes bored radially through the cast end rings give effective ventilation for rotation in either direction.

The new cast winding rotor is said to be especially effective on induction motors of the "Squirrel cage" type.

Books and Bulletins

Electricity and Magnetism for Engineers

Part II. Electrostatics and Alternating Currents

by Harold Pender, Ph.D., Professor -in-Charge, Electrical Engineering Department, University of Pennsylvania; Vice-President and Fellow, A. I. E. E. Size 6 by 9 in.; 221 pp.; published by the McGraw-Hill Book Company, Inc., New York, and for sale by the Technical Book Shop, San Francisco. Price $2.00.

This volume completes the text of this work, the first part, "Electric and Magnetic Circuits," having appeared some months ago. The two volumes cover substantially the same ground as that of the author's "Principles of Electrical Engineering," published in 1911, but the treatment is different, the discussions are fuller, and practical applications are more freely introduced.

The second part includes chapters on Electric Fields of Force, Electrostatic Capacity, Sine-wave Alternating Currents, Polyphase Circuits, and Symbolic Notation. An index to both parts is appended.

A New Webster Dictionary

Under the title of Webster's Collegiate Dictionary, G. C. Merriam Co., Springfield, Mass., have published a singularly successful abridgment of Webster's New International Dictionary. Measuring 8⅞ by 6 inches and containing 1248 pages, the book embraces a vocabulary especially designed to meet all the needs of the student, the writer and the business man. Special features ar a pronouncing glossary of Scottish words, a list of abbreviations used in writing and printing, rules for punctuation and the use of capitals, and a pronouncing biographical dictionary. These and several other useful supplements make the volume one of immense practical value.

The Thin Paper Edition-de-Luxe is well bound with gilt edges and round corners; it is printed on excellent paper in clear type, and is distinctly ornamental.

National Forests and the Water Supply

A most attractive and interesting booklet, "What the National Forests Mean to the Water User," by Samuel T. Dana, Assistant Chief Forest Investigations, has been put out by the Forest Service of the U. S. Department of Agriculture. The four main uses of water—for irrigation, power, navigation and domestic supply—are considered, the author showing that the great bulk of the water supply in the West originates in and is dependent upon the National Forests. The results of forest-destruction are traced, and some of the work of the Forest Service outlined. The booklet is illustrated with a number of very fine photographs.

Engineering Experiments

An investigation of statically indeterminate structures has been conducted by the Engineering Experiment Station of the University of Illinois to obtain a convenient method of analyzing the moments, stresses and deflections for a number of typical structures. The analyses were based upon the assumptions that the connections are perfectly rigid, that the length of a member of a rectangular frame is not changed by axial stress and that the shearing deformation is zero. The method used in the analyses and the equations derived are published in Bulletin 108 entitled, "Analysis of Statically Indeterminate Structures by the Slope Deflection Method," by W. M. Wilson, F. E. Richart and Camillo Weiss. The method has been explained in sufficient detail to enable the designing engineer to use it in the solution of his problems.

Engineering Index Annual

The 1918 edition of the Engineering Index Annual has just been issued. This index which was formerly published by the Engineering Magazine Company is now published by the American Society of Mechanical Engineers. It is a complete index to all engineering material published by technical journals, and as such is a unique work of reference. A concise but adequate description is given of every engineering article published anywhere. The price is $3.00, postpaid.

The Story of Johansson

An extremely interesting little booklet entitled "The Story of Johansson and His Mysterious Gages" is being distributed by C. E. Johansson, Inc., of New York, to advertise the Johansson Standard Gaging System. In 44 compact pages it tells the story of Johansson's work and experiments, and the problems he encountered during the development of his idea.

Transplanting Buildings

In a neat, profusely illustrated booklet masquerading under the ingenious title "Moving Pictures," John Eichelay Jr. Co. of Pittsburgh show some hundred photographs of their achievements in moving buildings and machinery intact. The booklet is small and compact, and the photographs extremely interesting as illustrations of the apparently impossible feats accomplished by modern engineering and equipment.

Miscellaneous

Throop College of Technology has sent out its quarterly catalog describing courses of instruction, requirements for admission, and giving general information concerning the college.

"Industries and the State under Socialism" is the title of a pamphlet by Rome G. Brown.

The Industrial Accident Commission of the State of California has published a report on special investigations of serious injuries, for the period Jan. 1, 1914 to June 30, 1918.

The latest number of the "Esterline Graphic," issued monthly by the Esterline Company, reviews some actual results obtained with Esterline graphic instruments.

The May, 1919 number of the "National Mazda Stimulator" appears as an attractively arranged booklet featuring house wiring.

Electric Appliances

Large and effective folders have been sent out by the Edison Electric Appliance Company, of Chicago, to advertise the General Electric and Hughes Appliances. Accompanying the folder is a booklet showing, in condensed form, colored reproductions of the company's 1919 spring advertising.

The same company gets out a good window display in the shape of a cutout kitchen scene advertising the Hotpoint Iron.

Fire Protection

An interesting and effective booklet on fire protection has been issued by the Foamite Firefoam Company of New York. A number of very dramatic illustrations, showing actual fires and their subsequent extinction by Foamite Firefoam, constitute a forceful array of evidence.

Annual Report of State Oil and Gas Supervisor

The Third Annual Report of the State Oil and Gas Supervisor of California for the fiscal year 1917-1918 has been issued by the California State Mining Bureau, as Bulletin No. 84. It is a cloth-bound volume of 617 pages, containing a full review of oil and gas development in the state, and results of tests and inspections. A directory of Oil Operators and a full index are appended.

NEW ELECTRICAL DEVELOPMENTS

(The Pacific Northwest reports further particulars of the Cedar River hydroelectric project and a number of improvements and new plans in power developments. The Pacific Central District shows especial activity in the construction of new power lines and in water developments for irrigation purposes, while the Pacific Southwest and Inter-Mountain District report various interesting city improvements and transmission lines.—The Editor.)

THE PACIFIC NORTHWEST

SEATTLE, WASH.—An ordinance is before the city council calling for purchase of $9100 worth of meters for the lighting department.

SEATTLE, WASH.—Electric lighting fixtures estimated to cost $10,000 are to be installed in some of the present school buildings. Bids have not yet been called.

FLORENCE, ORE.—The city election resulted in favor of bonding the city for $2000 for purchasing a Diesel engine to operate the light and water plant for the city.

SEATTLE, WASH.—An appropriation of $14,000 for completing the Ballard and Yesler Way substations of the city lighting department has been passed by the city council.

VALLEY, WASH.—Arrangements are being made by the farmers on the west side of the valley to erect an electric transmission line from the local system to that neighborhood.

VANCOUVER, B. C.—A large power plant is to be installed on the Similkameen river three and a half miles above Oroville at an expenditure of $350,000. The power will be used for pumping water for irrigation purposes and for the operation of mines in the district.

ROSEBURG, ORE.—William Pollman, owner of the Roseburg light and water plant, has been inspecting the properties with a view of making extensive improvements. The pumping and power plant on the North Umpqua will be improved and the entire system put in shape to accommodate Roseburg's increasing demands.

WALLOWA, ORE.—The case of the city of Wallowa against the Enterprise Electric Company, alleging poor service and inequality of rates, was dismissed by the Oregon Public Service Commission subject to the fulfillment by the company of certain requirements relative to the filing of service records and plans for the elimination of flat rates.

BREMERTON, WASH.—The naval appropriation bill recently reported to the house calls for an additional $405,000 for the Puget Sound Navy Yard over and above that provided for in the bill which failed of passage in Congress last winter. Additional items are: filling, grading and construction; seawall $350,000; power plant $15,000; additional storage warehouse $40,000.

SEATTLE, WASH.—Acting Mayor Lane has decided to allow the ordinance appropriating $30,000 to finance drilling operations at Diablo Canyon and Ruby Creek to become a law without his signature. Plans will be prepared at once by A. H. Dimock, engineer, for a complete investigation of the Skagit project, the first work to consist of borings at the site of the proposed Ruby Creek dam.

YAKIMA, WASH.—Announcement was made here that the Pacific Power & Light Company had closed a deal with the Montana Power Company, by which the former will tie into the big transmission line of the Montana company at Lind and begin taking power from it. The transmission line of the Montana company extends from near Billings to Seattle, carrying a 110,000 volt current. For the uses of the Pacific Power & Light Company this current will be stepped down to 66,000 volts.

MEDFORD, ORE.—J. T. Gagnon, lumber mill operator of this city, has leased the Jacksonville railroad from its original owner and builder, W. T. Barnum. He will operate the road essentially as a supply system for his lumber mill, but will also conduct a freight and passenger business between this city and the county seat. The new owner announces that he will change the name to the Rogue River Valley railroad, will establish a new street car schedule and repair the equipment.

MARSHFIELD, ORE.—An estimate of what it will cost to put the power plant at the Smith mill in good running condition has been completed by the consulting engineer of the power company, Henry Grenacher. It is said to total $60,000. Four of the twelve boilers at the power plant supply power for the community at large. These the Mountain States Power Company plans to repair by putting in new pipes and rebuilding the dutch ovens underneath, which will cost about $30,000. The other eight boilers are smaller and are used by the big Smith mill. The $30,000 repairs on these will mean the rebuilding of the brick work beneath. Two new boilers must be bought.

MARSHFIELD, ORE.—Marshfield, North Bend, East Side, Coquille and Myrtle Point face a condition which may result in suspension of electric power and light, if the intention of the receivers of the C. A. Smith property to withdraw permission to the Oregon Power Company to operate the electric plant at the main Marshfield mill is allowed to be carried out. The probable solution is being considered here by the Oregon Power Company and the public in general. All the motors for generating electricity are centered at the Smith mill, which has been closed for several months. The Oregon Power Company was permitted to operate the engines and boilers and the electric dynamos in order to supply current.

SEATTLE, WASH.—In answer to a letter from the street railway men's union asking for an advance in wages for municipal railway employes that would, it is said, mean approximately $1,000,000 yearly increase in cost of operations, Superintendent of Utilities Thomas F. Murphine, of Seattle, answered that he could not recommend the proposed increase to the city council. He pointed out that it would be impossible to get the money for the advance asked and stated that while it is true that an increase of one cent in the fare would mean $1,000,000 more a year if everybody now riding would continue to ride, the experience of other cities showed that 20 per cent increase in fares brought only ten per cent increase of revenue.

SEATTLE, WASH.—Further immediate permanent development of the city's Cedar River hydroelectric power plant at a cost of $30,000 has been provided for by the utilities committee of the city council in order to care for the increased demand on the city lighting department for electric power. The extension is to consist of a 10,000 kilowatt additional unit at Cedar Falls to be housed permanently as an extension of the existing plant. The estimated cost of the unit is $280,000, and cost of transmission line necessary for the increased capacity will be $150,000. An ordinance has already been passed covering construction of a 7200 ft. penstock from the present masonry dam to the power plant at Cedar Falls at a cost of $195,000. This is the first extension of the Cedar River plant since the failure of the masonry to hold water. The original project was expected to provide a development of 35,000 kilowatts. Since the failure of the dam the city has been conducting sealing operations on an extensive scale and the authorization of the additional 10,000 kilowatt unit indicates that the sealing promises to be successful.

THE PACIFIC CENTRAL DISTRICT

MARYSVILLE, CAL.—Five miles of new canals to irrigate 600 acres of Yuba River lands have been completed and the water turned in.

CHICO, CAL.—J. B. Thompson, former resident engineer of the Stanford ranch at Vina, has filed on the waters of the Sacramento river, above Nord, and plans the irrigation of 60,000 acres.

PLACERVILLE, CAL.—Geo. F. Lough, landengineer, and R. H. Bennett, manager of the Western States Gas & Electric Company, have started on an inspection of 75 miles of water ditch system to Twin Lakes, the location of a large impounding enterprise recently finished by the company.

GREENVILLE, CAL.—The Trask Copper Mining Company have completed a power line from Englemine to their copper property. Power will be supplied by the Great Western Power Company. This new line will also furnish power for the Ruby Copper Mine, under bond to H. E. Bush.

MERCED, CAL.—Because late rains in the high Sierra prematurely melted the snow packs indications are that the irrigation supply, which is diverted from the Mreced River, will be depleted two or three weeks before the usual time, rather than extending to a later period, as was forecasted some weeks ago.

COLEMAN, CAL.—The Northern California Power Company has had to suspend the work of cementing its canal leading to the powerhouse at this place. The $30,000 job was about two-thirds completed. The company had to turn on the water as it needed more power, and the Coleman plant is the largest of six power houses.

TULARE, CAL.—R. E. Smith, district manager for the Mount Whitney Power & Electric Company, says that with the installation of 159 motors in his division since January 1st, there have been placed under irrigation more than 10,000 acres of land, representing 1623 individual installations. These plants average 10 horsepower each.

RED BLUFF, CAL.—At a recent meeting here property owners representing all parts of Tehama county passed a motion authorizing the appointment of a committee of fifteen landowners to take steps toward the formation of an irrigation district as a part of the Iron Canyon project. The landowners elected are E. L. Sission, chairman, and E. L. Randall, secretary.

FRESNO, CAL.—An expenditure of between $50,000 and $60,000 in the extension of its cables in north and east Fresno is announced by the Pacific Telephone & Telegraph Company as a part of its program of service improvement and development this fall. Actual work on the extension will begin in September, according to a statement by Maynard Bailey, superintendent of the Fresno idstrict.

MERCED, CAL.—A petition for the formation of the Plainsburg Irrigation District, to embrace 57000 acres of land in the Plainsburg vicinity, has been presented to the county supervisors. The petitioners propose to establish a

pumping plant irrigation system for this district, similar to the Alpaugh project. It is the plan to connect every five or six pumping plants so that they will supply water together instead of individually.

FAIRFIELD, CAL.—The vast irrigation project which was the result of the attempt of the defunct Solano Irrigated Farms to irrigate the area west of Rio Vista and east of Suisun, has again been revived. This is announced by A. C. Gregory, local civil engineer, who will have charge of the revival of the 48,000 acre project. Gregory said that a continuation of the present activity might result in the beginning of work within the next few months.

WOODLAND, CAL. — The Yolo Water and Power Company has been reincorporated under the laws of the State of Delaware. The new company will take over the old concern and has authorized immediately the issuance of $2,550,000 six per cent preferred stock. Close upon $10,000,000 is involved in the reorganization and the development of its projects, but $3,000,000 will be raised immediately to pay off old obligations. This concern furnished water for most of the rice acreage of Yolo county.

SACRAMENTO, CAL. — The preliminary report of the Assistant State Engineer, Major Paul M. Norboe, covering his investigations of the Big Valley Irrigation Project just made, shows the proposed project to be feasible. Big Valley is situated in Modoc and Lassen counties. The estimated cost of the enterprise is $30 or $40 per acre, which is decidedly lower than the estimate placed thereon by the proponents of the project. The report stipulates that there is sufficient water to accommodate 20,000 acres or more.

SUNNYVALE, CAL.—A resolution of Intention was adopted by the trustees at a recent meeting to submit to the voters a proposition to acquire a distributing system and facilities for supplying light and electricity to the town of Sunnyvale, and directing the Town Attorney to file with the Railroad Commission a petition requesting that the said commission shall fix and determine the compensation to be paid by the town to the owners of the existing electric system.

MERCED, CAL.—Application to appropriate water from the Merced River, Mariposa county, tributary to the San Joaquin River, has been filed with the State Water Commission by E. N. Rector as follows: 1200 cubic feet per second, for power for generation of electricity for lighting, manufacturing, pumping, etc. Diversion works consist of concrete, steel and wood dam 300 ft. high, and main canal 8 miles long. The amount of water to be stored is 700,000 acre ft. per annum. Estimated cost, $1,500,000. Construction work will begin about August, 1920, and may be completed in 1922. Water will be returned to Merced River after use.

FRESNO, CAL.—The sale of 30,000 acres of land, sawmills, flumes and plants at Shaver Lake, property of the Flume and Irrigation Company, to the Southern California Edison Company for 2,000,000 for the purpose of developing an $8,000,000 electric power project to supply Los Angeles with cheap power, has been recently effected. Work on the plants to develop into power the force of water now used for shooting logs down to Clovis through the flume will begin soon. Power produced in this way will permit the elimination of the big, expensive steam plants now used by the Edison Company to develop electric power in Los Angeles. The two million dollar purchase includes 30,000 acres of timber land on Shaver Lake, the water rights, reservoir sites and the flumes used for floating logs down to the mills. It also includes the mills and property of the company in Clovis. This project involves expansion and extension of the Edison company's plant at Huntington Lake, the construction of twenty miles of railroad from Auberry, and the employment of thousands of men.

THE PACIFIC SOUTHWEST

LOS ANGELES, CAL.—That a contest to prove the $13,500,000 power bond election result invalid will be started as soon as the returns are officially tabulated, is the statement made by Walter J. Little, secretary of the Municipal Taxpayers' League.

LOS ANGELES, CAL. — Machinery for the municipal power plant No. 2 in the San Francisquito Canyon is to include hydraulic equipment, electric generators, transformers, auxiliary electric equipment, etc. The cost is estimated at about $500,000.

ORLAND, CAL.—Owing to increase in rates the Orland Water Users' Association is contemplating the installation of an independent telephone system, the service to be provided at cost to the legal water users in the Orland project. There are more than 700 using water supplied by the association.

LOS ANGELES, CAL.—Wm. R. Wright has filed application with the State Water Commission for 5000 acre feet annually of the waters of Big Dalton Canyon, Los Angeles county, for storage for irrigation and agricultural purposes. The main conduit will be approximately 2500 ft. long and the water will be used on 20,000 acres.

LOS ANGELES, CAL.—It is planned to have the Pacific Electric Railroad center its tracks along Trolleyway Venice from Winward to Marine in order to provide a suitable boulevard from the Venice Boulevard to Marine St.

LOS ANGELES, CAL.—The Sespe Light and Power Company has made application to the State Water Commission for a permit to appropriate 25 cubic feet per second on all unappropriated flow of the waters of the Sespe River, Ventura county, tributary to the Santa Clara River. The water is to be used for agricultural purposes.

LOS ANGELES, CAL.—Specifications for the installation of the ornamental lighting system on Broadway from California street to Tenth street have been approved by the Public Service Commission. The system will consist of 134 lamps mounted with two 1600-cp. lamps.A temporary system is now being installed to be used during the change from the old to the new system. The cost is estimated at about $100,000.

PALO VERDE, CAL.—Joseph F. Graham has applied to the State Water Commission for 3 cubic feet per second of the waters of Palo Verde Lagoon, Imperial county, tributary to Colorado River, for agricultural purposes on 80 acres. Water will be pumped out of the lagoon by one 3½ inch and one 5 inch American centrifugal pump; total lift, 12 feet. The pipe line will be one-quarter mile long, and the estimated cost $60,000.

PHOENIX, ARIZ.—A special election was held June 19 to vote on the issuance of $1,300,000 bonds for a new gravity water supply system for the city. The project involves the construction of an infiltration system in the Verde river about 33 miles from Phoenix, a 42-inch pipe line 157,500 feet in length and a reinforced concrete reservoir of 25,000,000 gallons capacity located on one of the mountains adjacent to the city. L. B. Hitchcock is the city engineer and Hiram Phillips, St. Louis, Mo., consulting engineer.

YUMA, ARIZ.—The Southern Sierra Power Company of California has entered into a contract with Sanguinetti & Ewing, of Yuma, Arizona, for the extension of its electric power transmission system to the irrigated districts of this region for the purpose of using the power to operate pumping plants and certain types of farm equipment. The Yuma Gas, Light and Power Company opposed the entry of the Southern Sierra Power Company to this field and it appealed to the State Corporation Commission of Arizona to issue an order against the power lines of the California corporation entering that State. The Corporation Commission, however, refused to take any part in the fight between the two companies and the proposed power lines will be built, it is announced. Twenty thousand acres of land will be placed in irrigation, in addition to the area already watered from pumping plants.

THE INTER-MOUNTAIN DISTRICT

BUTTE, MONT.—The Butte Electric Railway is to begin at once paving the track on West Granite street. The cost will be from $25,000 to $30,000.

BUTTE, MONT.—The consolidated income of the Montana Power Company for the four months ended April 30, 1919, as submitted to the New York Stock Exchange, shows gross earnings of $2,430,641, and a surplus of $338,-388.

WINNEMUCCA, NEV.—Construction work on a power line to Thorne, to the property of the Simon Lead Mining Company in the Simon district of Mineral county, will be started at once, according to P. A. Simon, president of the company. It will be fifty miles long and will cost about $78,000.

SALT LAKE CITY, UTAH.—The electrification of the Salt Air Railroad, to Salt Air Beach, is so near completion that it will be in operation before the end of June. The automatic substations have many novel features. The electric cars are now on the way from the East, traveling on their own wheels.

BATTLE MOUNTAIN, NEV.—Engineer O. P. Adams, with the assistance of Lorenzo D. Greel, special supervisor representing the Reno Indian Agency, finished laying out a town site on the Executive order reservation set aside for the Shoshone Indians. The well from which it is expected irrigation water will be drawn is located in the center of the place. It will be sunk under the supervision of F. L. Bixby, now on the staff of the University of Nevada.

FALLON, NEV. — Representing the Nevada Valleys Power Company, which furnishes the city of Fallon with electricity, F. J. Early appeared before the County Commissionres with an application for a new franchise to extend over a period of fifty years. Early said his company desires to install a large power development plant on the Truckee river and that it will be necessary to float forty-year bonds. He said the lease now held by his company on the Government hydroelectric plant at Lahontan dam would be renewed if the Government authorities are agreeable. This lease expires in three years.

RENO, NEV.—That direct telephone toll line from Reno to Tonopah, and to Goldfield, connecting with other Southern Nevada points, will be constructed, has been announced by officials of the Bell Telephone Company of Nevada. The officials are now on their way to Tonopah. At the present time Yerington is as far south as telephone connections can be made from Reno.

BOISE, IDAHO.—The Idaho Power Company is planning to erect a transmission line from American Falls to Pocatello, a distance of 25 miles. The company is now installing a 3600 kva. generating unit at its Lower Salmon hydroelectric plant.

FALLON, NEV.—Project Manager John F. Richardson and Project Counsel R. M. Patrick spent several days in conference with J. L. Savage of the Denver office of the reclamation service. Savage is the designing engineer of the service and the three men went over the scheme of building the Horseshoe dam structure at a point about nine miles above Gardnerville where a site has been determined upon. As contemplated this dam will be 222 feet in height, will cost $1,300,000, and will impound about 50,000 acre feet of water. The storage thus effected would be used in the Gardnerville, Minden and Dayton vicinities, and would make possible the bringing under cultivation of many thousands of acres of fertile lands now unused in the upper valley through the lack of irrigation water.

THE VACUUM CLEANER —— THE VACUUM CLEANER

AN EMPTY BOTTLE was suggested as an appropriate symbol for the Vacuum Cleaner department on this, the first of July. But aside from the implication of dry reading, it is necessary to point out that the characteristic thing about a Vacuum Cleaner is not the emptiness of its vacuum, but rather the variety of objects it has found with which to satisfy itself. Some of the matter thus collected is here displayed—such odds and ends of other people's lives as find their way from time to time into an editorial office and are picked up by the office Vacuum Cleaner, to appear later in its capacious bag.—The Editor.

Discovered — Twins!! Or rather, they seem not to have been discovered until after the publication of the June 15th issue of the Journal of Electricity. For one of these gentlemen is Major Sever, formerly representative of the War Industries Board on the

Pacific Coast, and the other is Lieut.-Col. Richard Park of Berkeley, Cal., both well known to electrical men of the West. Unfortunately, Colonel Park, who here appears on the left, masqueraded under the title of Major Sever on page 593 of last issue. Apologies are offered—but do you blame the compositor?

When the town goes dry, not only will a load be lifted from the sheriff's shoulders but, we understand, a load will be lifted from the electric power industry as well. The power demand of breweries and distilleries, as well as the lighting demand for many a corner property, will be withdrawn. Most of the towns that went "dry" during the war recouped their losses by the war prosperity which began to show itself about that time, but now these towns that go "dry" will see temporary depression and the lighting company will receive a severe setback in revenues from loss of this class of business. To assist this condition, the business department of one large electric company has issued a booklet for distribution among the liquor trade in towns supplied by them in order to assist the new business departments in replacing lost business. The midnight soda fountain may be expected soon to make up the deficit.

The wedding at high noon need no longer flourish in the land. The information is submitted for the social guidance of any electrical man contemplating the fatal step. It seems, apropos of July 1st and its accompanying phenomena, that noon is the traditional hour of the wedding ceremony, because in the olden days in England the bridegroom could not be relied upon to be sober any later in the day.

THE BURIAL OF SIR JOHN BARLEYCORN
(Written the morning after)

I

Not a cheer was heard, not a joyful note
As the corks from the bottles we hurried;
Not a soldier could drink a farewell shot
And even Frank Watts looked worried.

II

We buried him darkly at dead of night
The while through dark glasses gazing;
By the staggering moonshine's tipsy light
And the Mazdas our visions dazing.

III

Few and short were the prayers we said
As we tried fifty cents to borrow,
To buy a Scotch whisky for spinning head
Which would bitterly ache on the morrow.

IV

We thought as we swallowed this good-bye drink
With our eye-balls tearfully streaming,
That never again an 'igh ball we'd sink
And our joys 'd be only in dreaming.

V

Sadly we talked of the spirit that's gone
And o'er our last drink repined him;
But little he'll wreck if they let him sleep on
In the grave where our Congress consigned him.

VI

We drank it down and hardly had done
When outside the bar-room calling
We heard the rough voice of a son-of-a-gun
Of a prohib "never more" bawling.

VII

Slowly and sadly we all walked down
From that room in the second story;
The bottles were placed on the cold hearthstone
And left him alone in his glory.

—A. H. H.

ENGINEERS OF YESTERDAY—12. NEWTON

(Series compiled by A. L. Jordan)

If an apple falls to the earth, does the earth rise to meet the apple?

Since gravitation is mutual, the answer is theoretically, Yes; practically, No, in the sense that it cannot be measured. Newton (born 1642, the year of Galileo's death), is regarded as the greatest scientist and mathematician who ever lived. He published the famous law of gravitation (the force between two bodies is directly proportional to the products of their weights and inversely proportional to the square of the distance between their centers) in 1666; invented his reflecting telescope in 1668; discovered the cause of white light being separated into colors by a prism in 1672; published the law for the velocity of sound in 1676, his three laws of motion in 1687 and the law for the rate of cooling of heated bodies in 1698. He performed experiments in many other lines, notably in electricity, and his great mathematical writings are still used. He became Chancellor of the Exchequer, Master of the Mint and President of the Royal Society. He died, a bachelor, in 1727.

THE VACUUM CLEANER —— THE VACUUM CLEANER